Consulting Engineer

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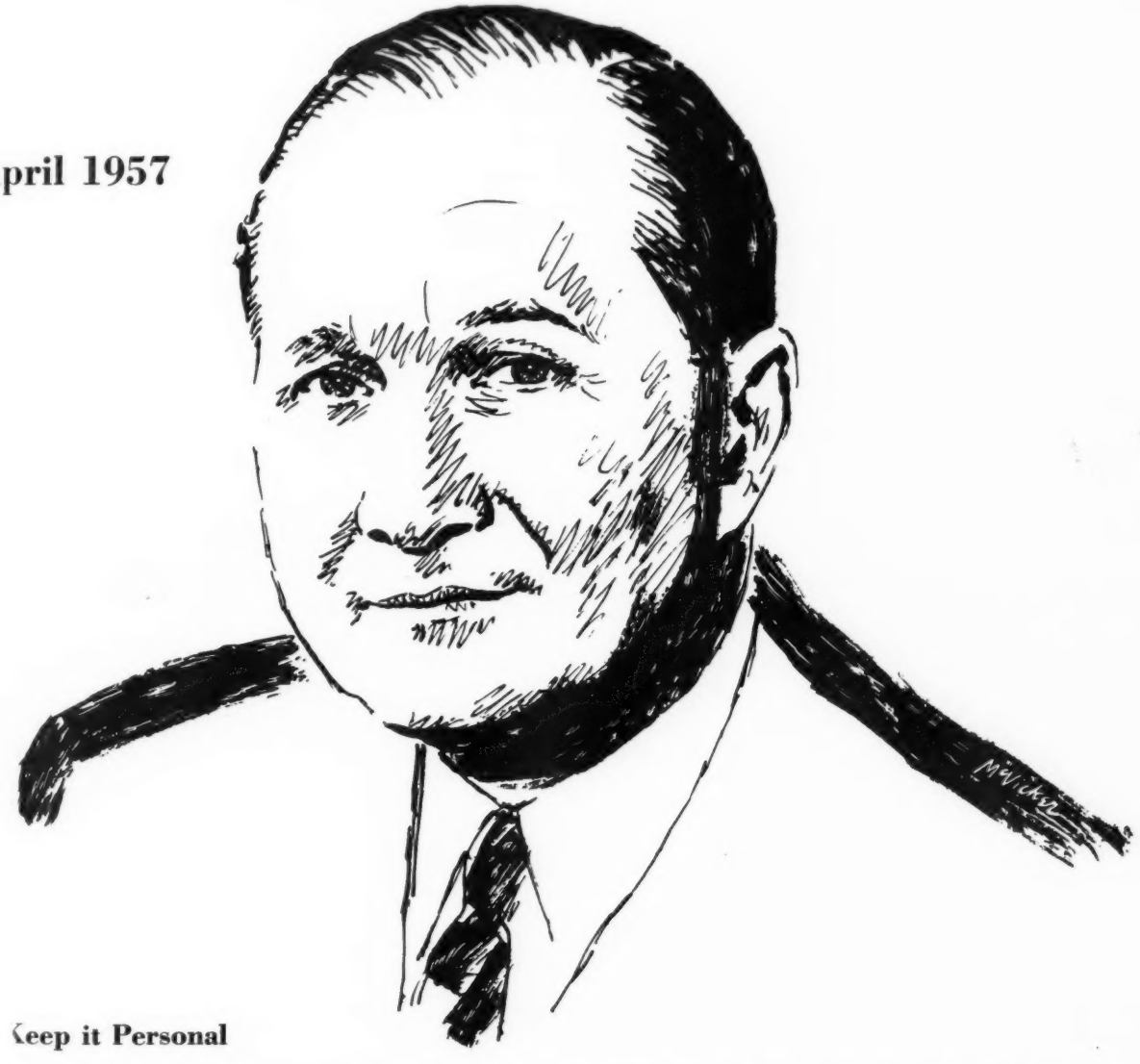
April 1957



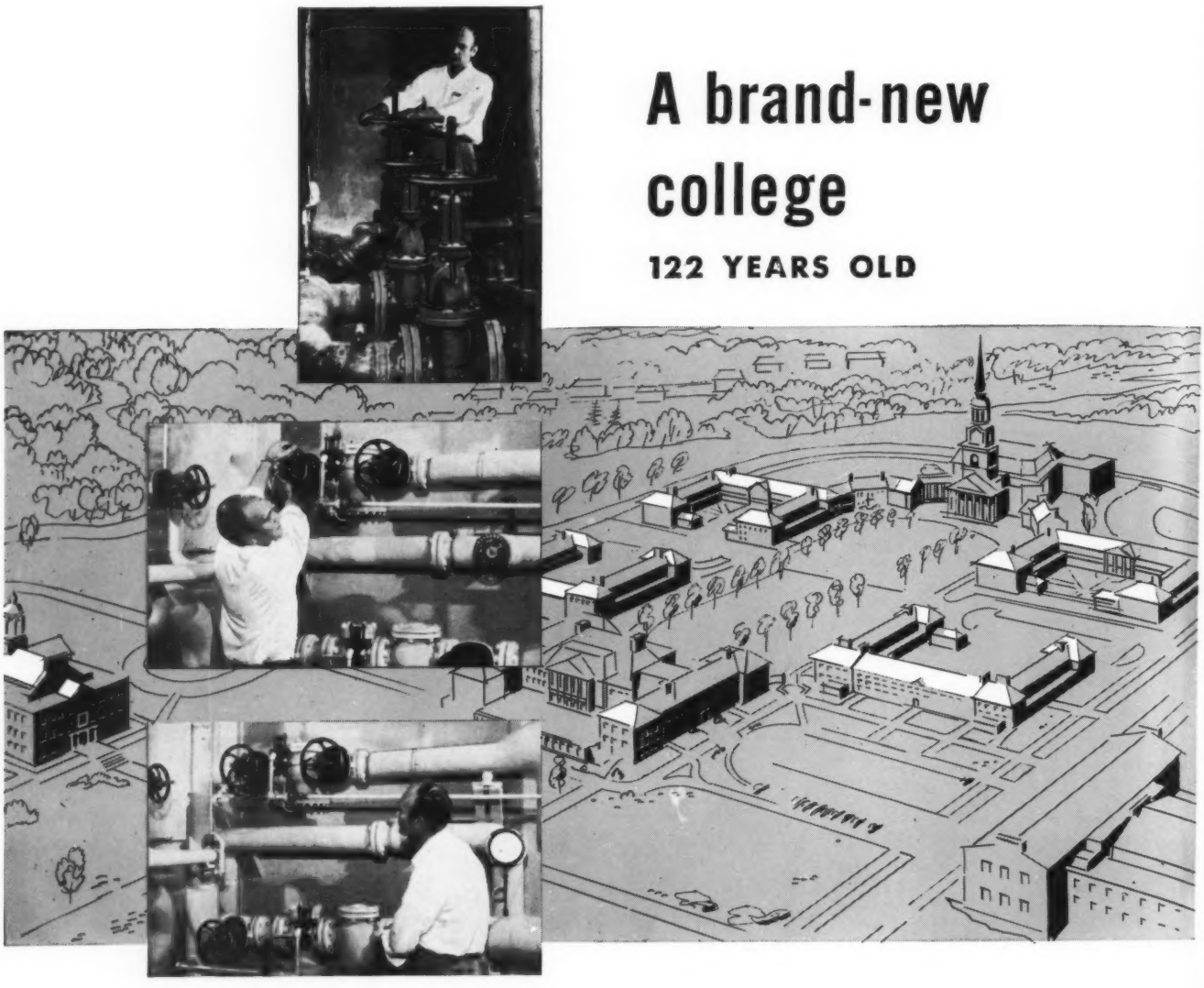
Keep it Personal

EARLE M. RADER, partner, founder, and chief engineer of Rader and Associates, Engineers and Architects, Miami, Fla., did what many engineers considered almost impossible. He built up a large, successful consulting engineering firm in a State where most consulting firms are very small — often two-man offices, specializing in one field of engineering. This nine-year-old firm has 250 employees, including four other partners, 32 associates, and 26 additional

—Continued on page 8

A brand-new college

122 YEARS OLD



New Wake Forest College campus at Winston-Salem, North Carolina. In 27 of the new buildings OIC Valves have been used exclusively. According to H. S. Moore, Supt. of Buildings and Grounds, OIC Valves have never created maintenance problems for him in all his experience.

and you see OIC Valves everywhere!

Wake Forest College has been transplanted 110 miles from its original site to Winston-Salem, N. C. Its new campus consists of 28 sparkling, modified Georgian buildings, and everywhere you look everything is crisp and modern . . . from its beautifully designed quadrangle to its very last valve.

If you're ever close to Winston-Salem, visit Wake Forest College and enjoy this spectacle of modern design and construction techniques. You may see ideas you'll want to duplicate even down to the very last OIC Valve . . . the always modern, ever dependable, accepted valve line.

Architects: Larson & Larson, Winston-Salem, N. C.
Consulting Engineer: Louis Bouvier, Winston-Salem, N. C.
Materials Furnished by: Atlas Supply Co., Winston-Salem, N. C.

THE OHIO INJECTOR COMPANY
WADSWORTH • OHIO

OIC
FOUNDED 1881

VALVES

FORGED & CAST STEEL, BRONZE & IRON, LUBRICATED PLUG VALVES

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April 1957

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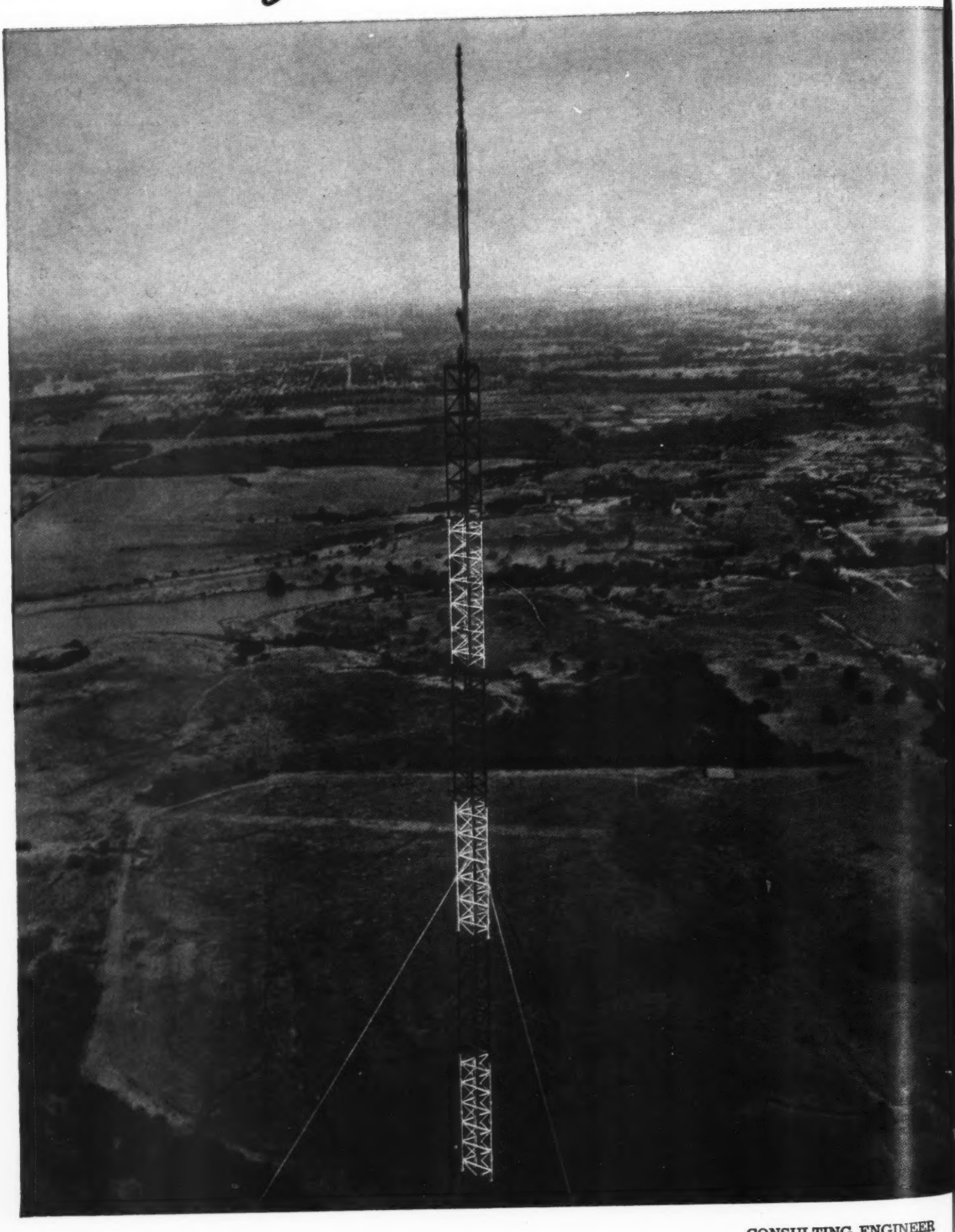
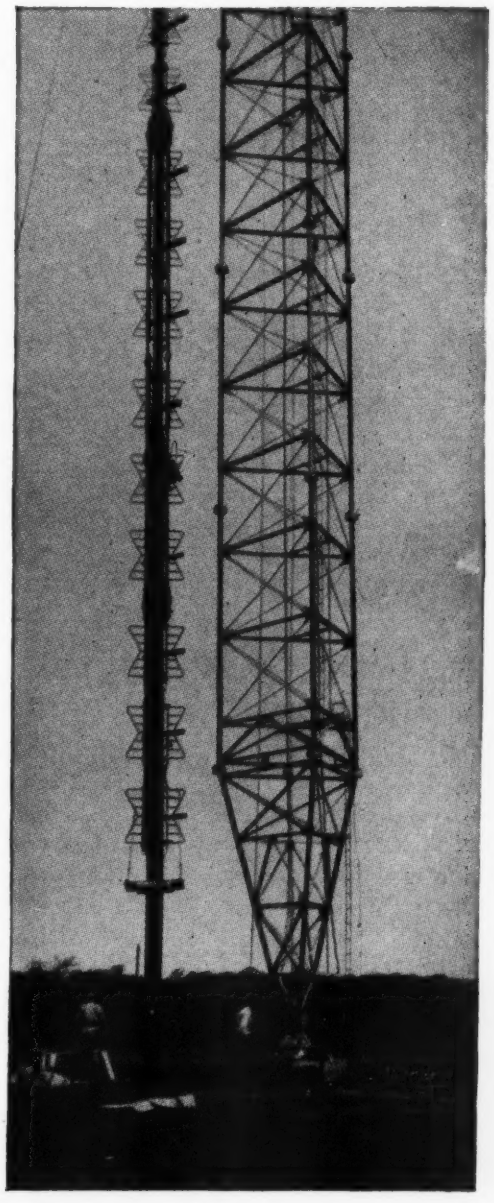
The Consulting Engineer's Professional Magazine

Tower weight reduced 20% with



USS MAN-TEN High Strength Steel

1078 ft. high, this television tower of Station KFJZ at Fort Worth, Texas, is designed to carry a 74-ft. VHF antenna weighing 10,000 lbs. and to resist winds up to 110 miles per hour.



TO PROVIDE THE STRENGTH needed and at the same time to keep tower weight low, round bars of USS MAN-TEN High Strength Steel were used in the tower legs.

This construction has two principal advantages. First, the round leg sections have only two-thirds the wind resistance of flat or angular sections. Second, because MAN-TEN Steel is one and a half times stronger than structural carbon steel, it can be used in smaller diameters for a given strength level. Thus, by using MAN-TEN Steel rounds, the tower could be designed lighter and still meet the wind resistance requirements.

Actually the USS MAN-TEN Steel legs are about 17 to 20% lighter—and thus are substantially smaller in diameter—than A-7 carbon steel legs would be. The resultant decrease in wind load made it possible also to decrease the size and weight of struts and bracing, thus further reducing the weight of the tower proper and making the use of smaller piers and lighter guys feasible.

So even though MAN-TEN Steel was used in only the tower legs, it resulted in a reduction in over-all tower weight of about 20%—from about 150 tons to 120 tons.

In all, 65 tons of USS MAN-TEN Steel are used in the legs. These range in diameter from 5 in. at the tower base to 3 in. at the top and were fabricated by Parkersburg Rig and Reel Company. The mild steel splice plates and intermediate gusset plates for bracing members were attached by jig welding. Bracing and struts were bolted to the legs in the field where the leg sections were assembled and erected.

This application is typical in that it illustrates how USS MAN-TEN and other USS High Strength Steels—USS TRI-TEN "E" and USS COR-TEN—are being used by structural engineers and bridge designers to build safer, more dependable and more durable structures—often at lower cost.

Our engineers will be glad to discuss the many advantages of High Strength Steel construction and give you the benefit of their long experience in applying these superior steels to your designs.

Tower was designed and fabricated by The Parkersburg Rig and Reel Company of Fort Worth, Texas and was erected by Beasley Construction Company, Muskogee, Oklahoma.

USS HIGH STRENGTH STEELS

UNITED STATES STEEL CORPORATION, PITTSBURGH • AMERICAN STEEL & WIRE DIVISION, CLEVELAND
COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO • NATIONAL TUBE DIVISION, PITTSBURGH
TENNESSEE COAL & IRON DIVISION FAIRFIELD, ALA. • UNITED STATES STEEL SUPPLY DIVISION, WAREHOUSE DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

UNITED STATES STEEL — USS HIGH STRENGTH STEELS — 1933 1957 — 24 YEARS OF PERFORMANCE

UNITED STATES STEEL

Earle M. Rader —

Starts on front cover

key staff members. Besides the main headquarters in Miami, the firm maintains Florida offices in St. Petersburg, Cocoa, and Homestead; branches in Washington, D.C., and Evansville, Ind.; and foreign offices in Panama City, Havana, Paris, and Madrid.

Born in St. Augustine, Fla., Earle Rader received his Bachelor of Science in Civil Engineering from Tri-State College in 1921, a Doctor of Science from Rider College in 1954, and his Degree in Civil Engineering from Tri-State in 1956. In addition to membership in the National Society of Professional Engineers, the Society of American Military Engineers, and the American Water Works Association, he is a former president of the Florida Engineering Society, and has been made a Fellow of the Society in recognition of his contributions to its development. In 1953 he was designated "Engineer of the Year" by joint action of the Florida Society of Professional Engineers and the Professional Engineers Association of Southeast Florida.

Many of the modern civil engineering projects completed in Dade County and the City of Miami were designed by Rader while he held various engineering positions in the city and county. After working for both the Montana Highway Department and the State Road Department of Missouri, he became Assistant Division Engineer and then Division Engineer for the City of Miami. In 1934 he was made Assistant City Engineer and from 1938 to 1940 assumed the full duties of the City Engineer, who was acting as Director of Public Service. From 1940 to 1942 Rader maintained a private practice until he was appointed City Engineer of Dade County. While in this position he supervised design and construction of the $6 million Rickenbacker Causeway and the $2 million Miami River Locks and Dam Project.

The firm of Rader and Associates, founded in 1948 under the name Rader Engineering Co., is equipped to handle the engineering aspects of a project from the time the client gets an idea to the day the project is in operation. Scope of the work includes all phases of engineering and architecture. Through a subsidiary, Wingerter Laboratories, Inc., the firm also offers sub-surface exploration, soil testing, and materials testing services.

Volume of work is divided roughly into three parts: work for governmental agencies, for private clients in this country, and for foreign clients.

Typical of projects for governmental agencies are the $12 million major extension of the water supply and distribution system serving Key West and the Florida Keys; Master Plan for the 335-acre, 1125-unit family housing project at Patrick Air Force Base, Fla.; and the Master Plan for development of the Northwest Maintenance Area at the Miami International Airport, including shops, accommodations for air-related industries, railroad connections, and service utilities.

For private clients, projects have ranged from an urbanization and master land use plan for a 2500-acre development near Titusville, Fla., that included topographic studies, zoning, and design of homes; to designs, plans, and specifications for electrical installations for the new Miami Daily News plant.

For foreign clients, usually governmental agencies, Rader and Associates have done extensive work on airports, harbors, and water and sewerage systems. Their engineers now are supervising construction of a water system they designed for Asuncion, Paraguay — a city of 250,000 population that never has had municipal water. In Ecuador plans have been completed for modernization of three seaports. At Puerto Bolivar, the world's largest banana port, bananas had been loaded by hand from balsa barges before the recent remodeling of the docks and installation of mechanical loading equipment.

A man who enjoys a challenge, as the growth of his firm indicates, Earle Rader is particularly enthusiastic about the firm's foreign projects.

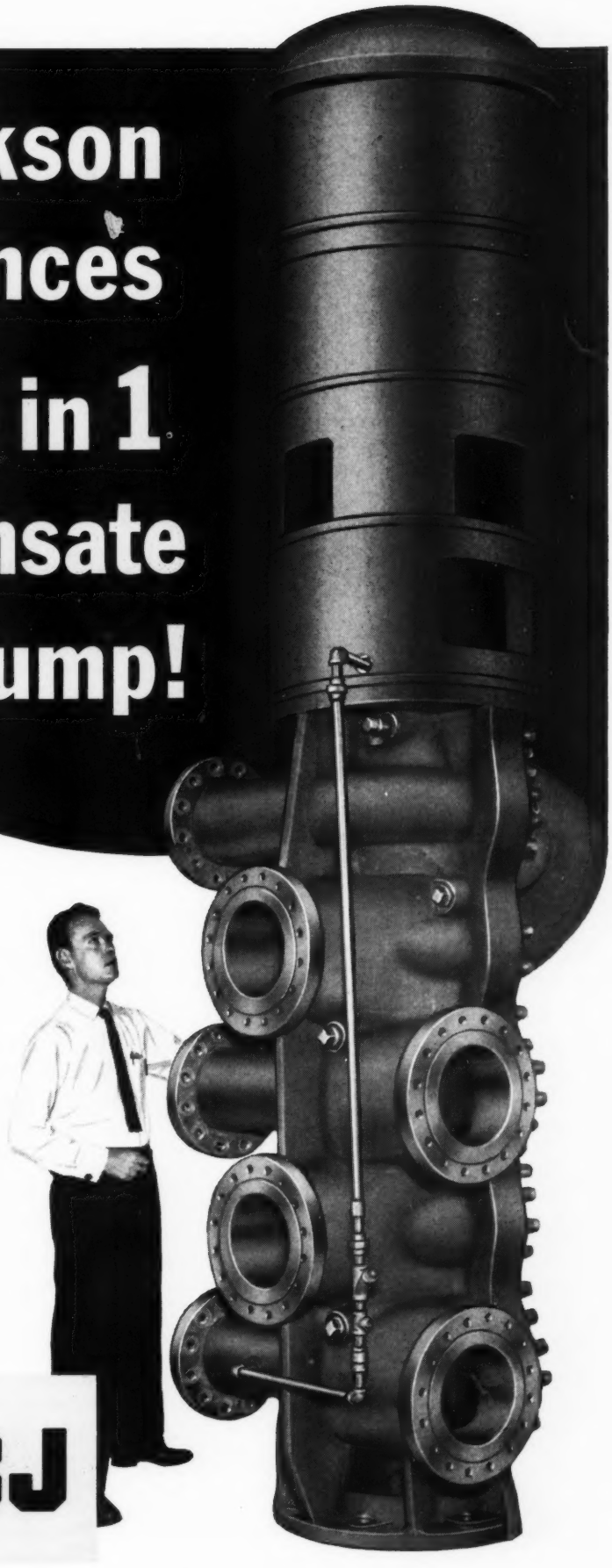
Pointing out that "A good part of the work we have done outside of the United States has been in Latin American countries," Rader went on to state, "We are impressed with the way these countries approach a proposed engineering project. They shop for quality rather than price. Almost without exception we find that they investigate carefully the qualifications of consulting engineering firms in the particular field in which they are interested. They want the best engineering available and are willing to pay a fair price for it.

"We U. S. engineers have several factors in our favor when dealing with Latin Americans. Many of their young men are sent to engineering colleges and universities here. When they return home they compare facilities, such as water and sewage systems, shipping facilities, and highways, with the modern installations they have enjoyed in this country. They encourage their governments to plan improvements. Also, U.S. Government missions sent to these countries point out needed improvements, and they have done such fine work for the Latin Americans that these countries are eager to employ U.S. firms.

"These people are in the process of developing fine universities and colleges of their own, and they are using U.S. textbooks to a large extent. The potential ability of their engineering students is high. What these men need is experience. When we undertake a foreign job, we hire local engineers to work with us. They gain experience, and we benefit by their knowledge of the local dialect and methods of operation. Where local engineering firms are available, we sub-contract some phases of the work to them.

"Although 50 of our own employees are bilingual, we found out early in our operations that each town

Byron Jackson announces FIRST 4 in 1 Condensate Pump!



1. Saves valuable floor space 2. One driver serves four pumps 3. Common shaft for all units gives increased reliability

This new Byron Jackson vertical unit actually contains four pumps in a common case, utilizing a common shaft. It saves valuable floor space and cuts operating costs because a single electric motor serves four pumps. Reliability of operation is increased because the use of a common shaft requires only a single stuffingbox – reducing packing maintenance. Three of the four pumps are single-stage and the fourth is a two-stage with external crossover. Axial and radial hydraulic balance is obtained by using double suction impellers and double voluted pump cases.

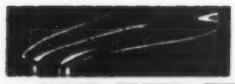
The outer casing is the vertically split type, with the four sets of inlet and outlet nozzles located in one half to allow the removal of the rotating element without disturbing the suction or discharge piping.

This pump has been successfully used for more than a year by a major power company. It was specially engineered by Byron Jackson to meet particular requirements of Burns & Roe, Inc., engineers and constructors in the power generating field. If space-saving is an important consideration in your plant, this new BJ multi-pump is designed for you. Call your nearby BJ Pump sales engineer or write:

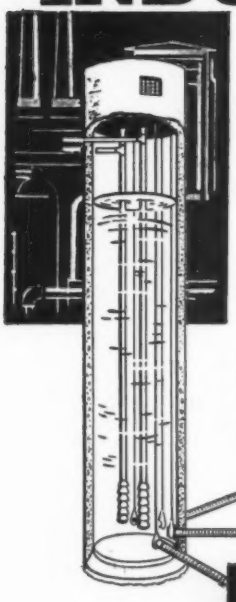
BJ

Byron Jackson Pumps, Inc.
A Subsidiary of Borg-Warner Corporation

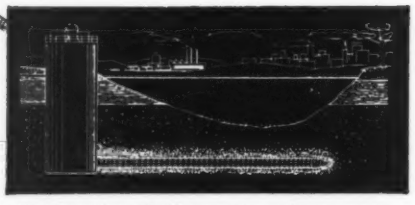
P.O. Box 2017A
Terminal Annex
Los Angeles 54, California



INDUSTRIAL *water...* a job for the RANNEY METHOD



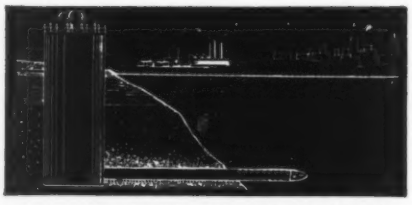
Conventional Collector. Proven by industries the world over, the collector that yields more naturally filtered water, with less equipment, less personnel, and fewer pumps than any other conventional collector.



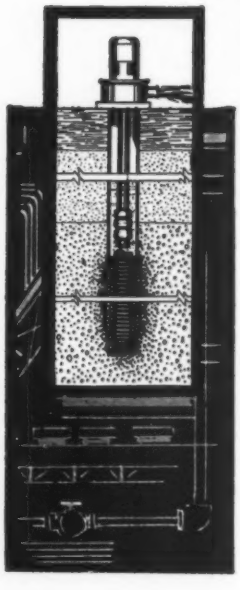
Infiltration Gallery. The gallery, engineered by Ranney, provides industry a low cost water supply. The gallery provides large quantities of clear non-turbid water in a revolutionary yet economical way, and it requires no maintenance.

A Few Industries Now Using the Ranney Method

Granite City Steel Co.
U. S. Steel Corp.
Wheeling Steel Corp.
Shell Oil Co.
The Texas Co.
American Cyanamid Co.
Eli Lilly and Co.
Allied Chemical & Dye Corp.
Monsanto Chemical Co.
Mead Corp.
MacMillan & Bloedel Ltd.
E.I. DuPont de Nemours & Co.
Olin Mathieson Chemical Corp.
Timken Roller Bearing Co.



Ranney Intake. The Ranney Intake, already has proven that plants and factories can obtain surface water both efficiently and economically. The Ranney Intake can usually fit into the design of your engineering department or consultant.



Ranney Vertube. Small industry and low volume users can now have a natural gravel vertical water well at low cost. Engineered with the same Ranney precision that has made their method a *must* for industry.

RANNEY METHOD
Dept. CO-1
Ranney Method Water Supplies, Inc.
841 Alton Ave. Columbus 19, Ohio
Associated With
Ranney Method Western Corporation
Ranney Method International, Inc.

or section of a Latin American country has its own dialect. A report written here in Spanish may evoke much humorous comment in a field office in, say, Asuncion, Paraguay. This poses quite a problem when making out reports and even in correspondence. Our letters and reports now are channeled through a native of the country for correction.

"Currency is another problem. Since the exchange rate varies, U. S. dollars are the only sure way of receiving the fee agreed upon. We do accept part of the fee in native currency and use this portion to pay the native engineers working with us.

"Doing business in foreign countries is similar to doing work in the U.S. in that to succeed you must keep two primary factors in mind. First, consulting engineering is like any other type of business, with the same type of profit and loss statements. To build a large engineering firm, you not only must have your books accurate and up to date but you must give them constant attention. At our office the accounting department prepares and we review weekly reports of current job costs. Engineers planning on going into private practice should take business administration in school, and take it seriously. There are three phases to an engineering firm's operation: getting the job, doing it, and collecting the fee. The financial health of the firm depends on the first and last of these phases.

"The second consideration is keeping the engineering service you offer on a personal basis. A client should be able to depend on a consultant to offer him the type and amount of engineering he needs—no more and no less. Many times the project must be scaled down to fit the client's budget or needs. This is one of the reasons why bidding for an engineering job is untenable. Besides being unethical, bidding puts the consultant in the position of having the client tell him what engineering is necessary. It is like going to a doctor with a pain in your side and asking how much he charges for an appendectomy. I believe that the only type of engineering firm capable of giving truly personalized service is a partnership, where a partner is in direct charge of each project.

"We are in the process, in Florida, of organizing a consulting engineers association to deal with such problems as bidding and corporate practice. We are studying the constitutions of other state associations and intend to develop one of our own based on what we learn from these and from the model constitution that the Consulting Engineers Council is drafting. We want to be sure that our association meets the requirements of CEC, so that, in time, we can join.

"Even discounting the amount of foreign work becoming available there is more than enough engineering work in this country for all consulting engineers. The time is right to present a united front to insure clients of good engineering and to insure a profitable business for us." ▲▲

This Whiting Crane at Continental quickly carries heavy coils of wire from storage to production—keeping machines busy without jam-up.

How Continental Steel's "special" cranes pay off!

Continental Steel Corporation, Kokomo, Indiana, depends on three "special" Whiting Cranes to keep production flowing fast. Two of them are 5-ton overhead cranes used to spot coils of wire accurately at automatic wire welding machines, then move the finished reinforcing fabric to shipping or storage. The third Whiting Crane is a low profile gantry with floor level hoisting drive. It moves all production in Continental's pickling department and has played an important part in increasing the company's wire production by nearly 50%. These cranes – like all Whiting Cranes – are "special" because each is custom engineered to do a specific job, day in and day out, with a minimum of maintenance.

WHITING CORPORATION, 15601 Lathrop Avenue, Harvey, Illinois

SEND FOR THIS REPORT!

An illustrated 6-page case study, "Custom Built Whiting Cranes for Continental Steel Corporation" tells how these cranes were engineered to solve special problems. Write for a copy today.

MANUFACTURERS OF CRANES; TRAMBEAM HANDLING SYSTEMS; TRACKMOBILES, FOUNDRY, RAILROAD AND CHEMICAL PROCESSING EQUIPMENT

The Reader's Guide

Covered Bridges

The modern bridge can be a beautiful structure, but there is hardly one of us who does not regret the passing of the old covered bridge. Even the small covered bridges spanning narrow streams were enough to make the children in the back seat of the touring car sit up and await the sudden change from light to darkness as the open road led into the wooden tunnel. As you drove through, at what seemed like a terrifically high speed, vertical planes of light from the cracks between the boards whipped across as though someone were flipping the pages of a book before your eyes. Some of those memories will return as you read "America's Covered Bridges," by Richard Sanders Allen, on page 92.

Do You Own Your Plans?

When you file your plans with the city or county building department, do those plans become public property, free for anyone to use? This is not a simple question to answer. As with most legal questions, it depends upon where you are and what court makes the decision. Albert Woodruff Gray comments upon this in his article "Are Uncopyrighted Plans Protected?," in this issue on page 103.

Dig Dig Dig

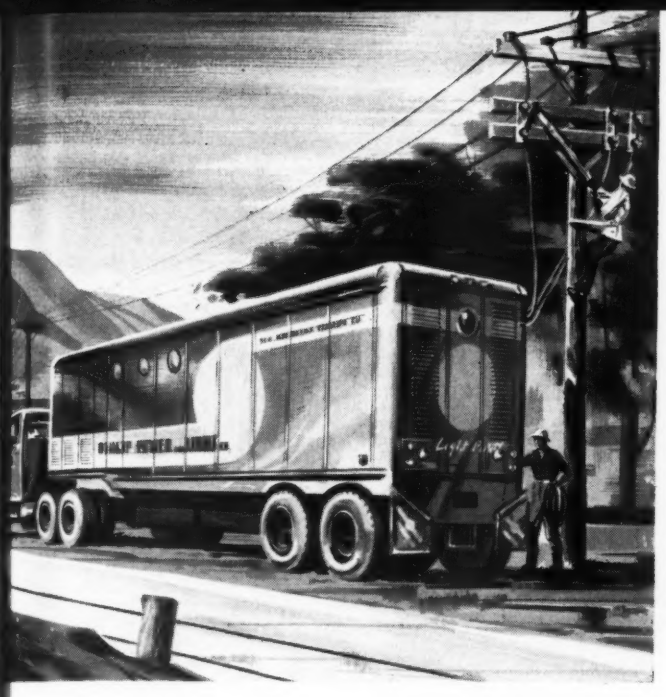
The power dredge, a remarkable unromantic machine, was actually one of the most influential inventions of man. Good or bad dredging can make or break a whole nation. Holland went from the greatest of all seafaring nations to commercial insignificance for lack of dredges in the 18th century. Then, with the invention of the power dredge, in the middle of the last century, her ports were again opened to world shipping and she regained her old position as a nation of great ports. All but a few of the world's waterways require constant dredging, and dredge designs have kept up with the demand for equipment that would handle larger and larger volumes from greater and greater depths. Carl H. Giroux, Special Assistant in the office of the Army's Chief of Engineers, is an expert on dredges and dredging. In this issue he reports on "New Ideas in Dredging," page 68.

Highway Design

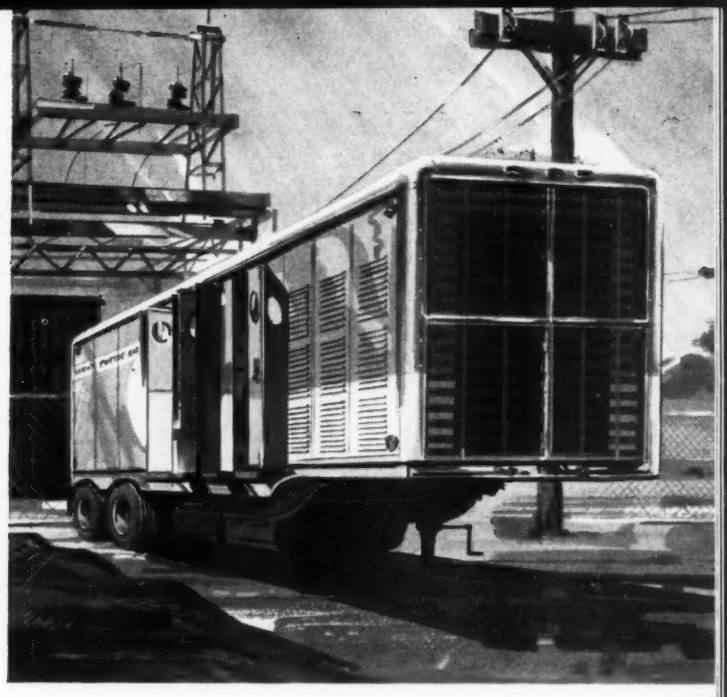
The building of the new highway system offers the consulting engineer the greatest opportunity of the age. What will this highway network be like? What will it mean to the public? What does it demand in the way of engineering skill and responsibility? No one knows the answers to those questions better than Ruben Bergendoff, of Howard, Needles, Tammen & Bergendoff, of Kansas City. Mr. Bergendoff has worked on bridge and highway projects in 40 states and 20 major cities in this country. His article, "Get Ready for the Highways of Tomorrow," is on page 76 of this issue.

The Arctic Engineer

Few engineers in the United States are familiar with the problems encountered in the design of water works for Arctic operation. Perhaps George Toman and some of his contemporaries in North Dakota have some inkling of the difficulties involved, but cold as it gets in North Dakota, that is comparatively balmy when one checks temperatures and degree days for areas close to the Arctic Circle. When you cannot drive nails through a wall because they would permit too much heat loss from inside the building, that is cold. Amos Alter, Chief Engineer for the Alaska Department of Health and Administrator for the Alaska Water Pollution Control Board, gives an idea of thermal design problems in his article "A Guide to Arctic Water Works Thermology," on page 84.

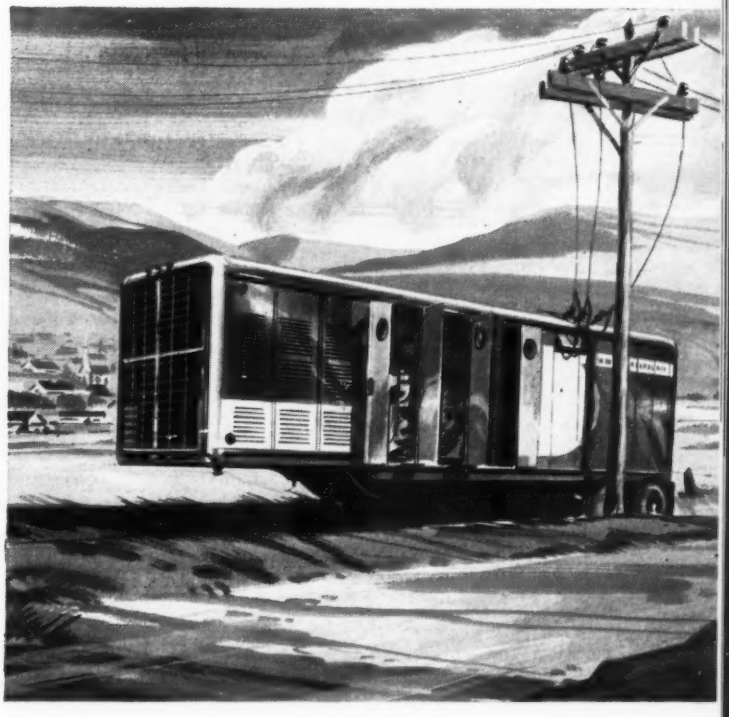


Relocating 12,400-volt line for new highway.
Hours used: 68 ¼ KWH generated: 22,700



Installation of new transformer for substation.
Hours used: 3 ½ KWH generated: 1,100

Feeding 12,400-volt sub-transmission line while stringing new conductors on transmission line.
Hours used: 145 KWH generated: 58,500



Handling daily peaks while existing transmission line and substation are being rebuilt.
Hours used: daily average 4

ELECTRO-MOTIVE DIVISION
GENERAL MOTORS LA GRANGE, ILLINOIS
Sales Offices in Chicago, New York, St. Louis, San Francisco

RECENT TRADE LITERATURE...

Altitude Valves

New 16-page technical bulletin W-4A fully describes G-A Cushioned Altitude Control Valves, which assure accurate water level control in elevated tanks and reservoirs. Featured in this catalog are illustrations, operating sequence, installation arrangements, general instructions, parts lists and dimensions.

Write to Golden-Anderson Valve Specialty Co., 1280 Ridge Ave., Pittsburgh 33, Pa.

Surge Relief Valves

8-page Bulletin W-2 contains complete information about G-A Cushioned Surge Relief Valves, which automatically protect water lines against excessive pressures caused by surges in the system. Sectional diagrams and installation arrangements are featured.

Write to Golden-Anderson Valve Specialty Co., 1280 Ridge Ave., Pittsburgh 33, Pa.

Pressure Reducing Valves

New 6-page Bulletin W-3A completely describes G-A Cushioned Water Pressure Reducing Valves, which automatically reduce an existing high pressure to a predetermined low pressure. The installation, operation, adjustment, servicing and specifications are fully described.

Write to Golden-Anderson Valve Specialty Co., 1280 Ridge Ave., Pittsburgh 33, Pa.

Solenoid-Operated Valves

Bulletin W-7A contains the latest technical data on G-A Cushioned Solenoid-operated Valves, which can be used not only as spray and quenching valves, but also for 1001 uses in almost every industry where remote control operation is desired. Both the all-bronze valves in sizes ½" to 2" and the IBBM valves in sizes 2½" through 36" are fully described.

Write to Golden-Anderson Valve Specialty Co., 1280 Ridge Ave., Pittsburgh 33, Pa.

Float Valves

G-A Cushioned Float Valves maintain accurate water level control in elevated tanks, reservoirs, coagulating basins, mixing chambers, etc. They are designed for either cold or hot water service in either the quick-opening or throttling design with integral or remote pilot control. Full technical data is contained in Bulletin W-5.

Write to Golden-Anderson Valve Specialty Co., 1280 Ridge Ave., Pittsburgh 33, Pa.

Swing Check Valves

Technical bulletin W-1 describes the G-A Cushioned Swing Check Valves which automatically close to prevent reverse flow on pump shut-down. Design and construction features are shown, along with complete parts list, dimensions and specifications.

Write to Golden-Anderson Valve Specialty Co., 1280 Ridge Ave., Pittsburgh 33, Pa.

Flowtrol Valves

Bulletin W-8A contains the latest technical data on G-A Cushioned Flowtrol Valves, which can be used either to replace troublesome gate valves that require frequent manual opening or closing, or in place of diaphragm valves. Available in either angle or globe body design, the Flowtrol Valve can be easily moved to the fully open or tightly closed position by simply moving a small pilot cock.

Write to Golden-Anderson Valve Specialty Co., 1280 Ridge Ave., Pittsburgh 33, Pa.

Readers Comment

Survey

Sir:

I am full of admiration for the great task you undertook to appraise the status and trends of the engineering profession, and for the timely and enlightening manner in which you have been presenting its results. While to obtain basic information not available elsewhere you had to resort to a survey by mail, and attempt a tabulation under various general headings, you have exhibited your awareness that averaged results are not enough and that often they can be misleading. Therefore, I highly commend the statement that you made that it is possible a well informed minority could well be far more revealing than a random average levelled by the common denominator of the majority (CE, March 1957, p. 95).

. . . Conclusions upon averaged results are used commonly in the social fields where the complexity of human behavior has presented the canvassers with startling surprises. Unwisely, these methods have been transplanted without benefit of rational adaptation to the engineering field with dangerous frequency. By the very principles of our rigid mental training only the incontrovertible process of reason based upon proven premises may dictate the course of logical conclusion. This irrefutable precept is being violated each time that we recourse to political considerations and expediency to direct the affairs of the engineering profession. That is why confusion and lowering of our standards result because, contrary to the often expressed belief in defense of our present engineering registration methods, democratic process is out of the question if the engineers are ever going to attain recognition and status in our society.

I repeat, by your enlightened interpretation and analysis of your survey you have significantly pointed out that, instead of being considered as mere statistics, we are members of a group that because of the very aspects of our many different abilities could impart great influence to the course of human achievement. Engineering societies who have indulged in the compiling of irrelevant data on "median" salaries, ages, and occupations, plus the platitudes and cult of averages that is the path towards mediocrity, please take notice.

M. von Ch. Barraza
East Orange, N. J.

Sir:

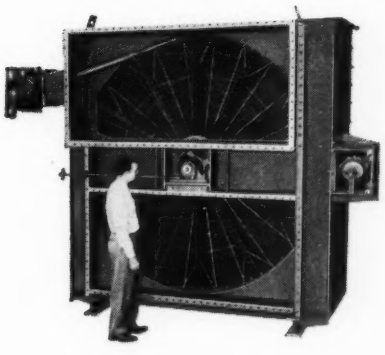
This feature article "Survey of the Profession — 1957 — Part IV" is a gem, and the members of the staff are to be commended. It is well written, and contains much information of value to both young and older men . . .

T. C. Brown, P. E.
Raleigh, N. C.

Digger Dan's Doll

Dear Sir:

Every good wife should know enough about her husband's business or profession to be able to discuss it with her friends. At every luncheon, tea, or bridge party, the ladies try to pass along some interesting conversational bit promoting their husband's position and his activities. The doctors' and lawyers' wives are particularly fortunate in that their husband's work is recognized by all present



HOW MANY STACK BTUs DO YOU BUY EACH YEAR?

Whether you burn it — or dissipate it up the stack — every BTU costs you money. In fact:

Yearly cost of fuel often equals the cost of your boiler. That's why heat recovery—or dollar recovery—is so important. Boilers simply have huge appetites for fuel . . . fuel that's constantly going up and up in cost.

And small boilers are no exception. Even with relatively small boilers—that is, between 25,000 and 250,000 lbs per hr—substantial heat recovery is possible. With a Package Ljungstrom Air Preheater, fuel consumption is most often reduced 10% or more! As a result, many plants have written off their Ljungstrom within two years.

Get more steam, and cleaner stack gases. Put it another way. The BTUs that you save with a Package Ljungstrom can be used to increase boiler output. What's more, higher combustion temperatures cut slagging . . . keep stack gases clean . . . allow use of cheaper fuels . . . reduce corrosion.

Comes complete, ready to install. Determine for yourself how easily a low-cost, *shop-assembled* Package Ljungstrom can be applied to your generating or process system. Ask for our brand-new 16-page brochure. It's yours with our compliments, simply by writing to the address below.

The Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

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FINANCING—Community-state industrial building program, lease-purchase, commercial credit.

BUILDINGS—Availability, sizes, location, descriptions.

SITES—Acreage, topography, utility services, photos, maps, industrial districts.

MATERIALS—Metals, industrial chemicals, wood, textiles, farm products.

MINERALS—Location, reserves, potentials, analyses.

WATER—Quantitative, qualitative analyses.

POWER—Capacity, network, industrial service, costs.

FUEL—Coal, oil, natural gas service, costs.

ENGINEERING—Schools, enrollments, specialization, research laboratories, services.

TAXES—Inter-state and community comparisons, assessment ratios, millages, corporate.

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For free copy of "Plant Location Services" booklet, or for details on how the PENNSYLVANIA PLAN can provide 100% financing for your new plant, write or call:

PENNSYLVANIA DEPARTMENT OF COMMERCE
Main Capitol Building, 493 State Street
Harrisburg, Pennsylvania
Phone: CEdar 4-2912

to be professional and dignified. Even the accountant's wife can convey some idea of her husband's importance by dropping some hint of his knowledge of who is or is not doing well financially.

As an engineer's wife, I have been imbued with the professional status of the engineer in private practice, and I strive valiantly to uphold his position in the structure of society . . . but it is hard to do.

On a recent afternoon, as my opponent playing East completed her impressive tale of how her husband won his last case (a trial just juicy enough to distract me from my hand), I searched wildly for an equally interesting report. It was not until sandwiches and cake were on the table that I began my account of the difficulties encountered in replacing a section of sewer in the older part of town. The reaction was immediate even if something less than pleasant.

Instead of improving my husband's social and professional prestige, he is now referred to as the local Art Carney. The more sophisticated, closer friends call him "Digger Dan" D'Addona.

While I resent their lack of understanding, I must admit that I, too, was not always in The Know. When I married a sanitary engineer I thought this would at least free us from plumbers' bills, but after two years I now realize that replacing the washer in a leaky faucet or changing the tone of a musical toilet takes a different type of talent.

I have learned a lot about sanitary engineering. I now know that BOD stands for biochemical oxygen demand, that certain bacteria have perfectly disgusting appetites, and that sewage lagoons are really clean enough to swim in, if you are totally devoid of imagination. I also know the capacity (in cubic feet) of every garbage truck in town.

But there is hope. I have been informed that my husband's next project will be a water works rather than a sewage disposal system, and if I am ever invited again to a tea, I can discuss algae growth instead of aerobic decomposition.

Mrs. L. Daniel D'Addona
Ann Arbor, Mich.

Better and Better

Sir:

There are two articles in your December issue of CONSULTING ENGINEER which I found most interesting. One is on "Sewage Lagoons for Suburbs or Small Cities," by Joe

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From incandescent to fluorescent . . . from porcelain enameled Dome Reflectors to latest 20—30% Upward Light porcelain enameled fluorescents . . . these RLM Specifications are the highest in history! In fact, today's RLM minimum standards are higher from both important standpoints: *quality construction*, as well as *quality lighting*. That is why the RLM Label on lighting equipment today is the buyer's assurance of outstanding industrial lighting advantages such as are listed here.

For each RLM-labeled unit it takes over a thousand words of quality specifications to cover the basic, nationally-accepted minimum standards for efficiency, performance and basic construction. In all, there are 10 types of industrial lighting units for which RLM Specifications have been developed. With each specification running over 1,000 words, that makes a total of over 10,000 words of specifications! You'll find them all in the latest RLM Specifications Book. For your complimentary copy, use the coupon or write: RLM STANDARDS INSTITUTE, Suite 835, 326 W. Madison St., Chicago 6, Ill.

Highest Industrial Lighting Standards in RLM History assure these advantages:

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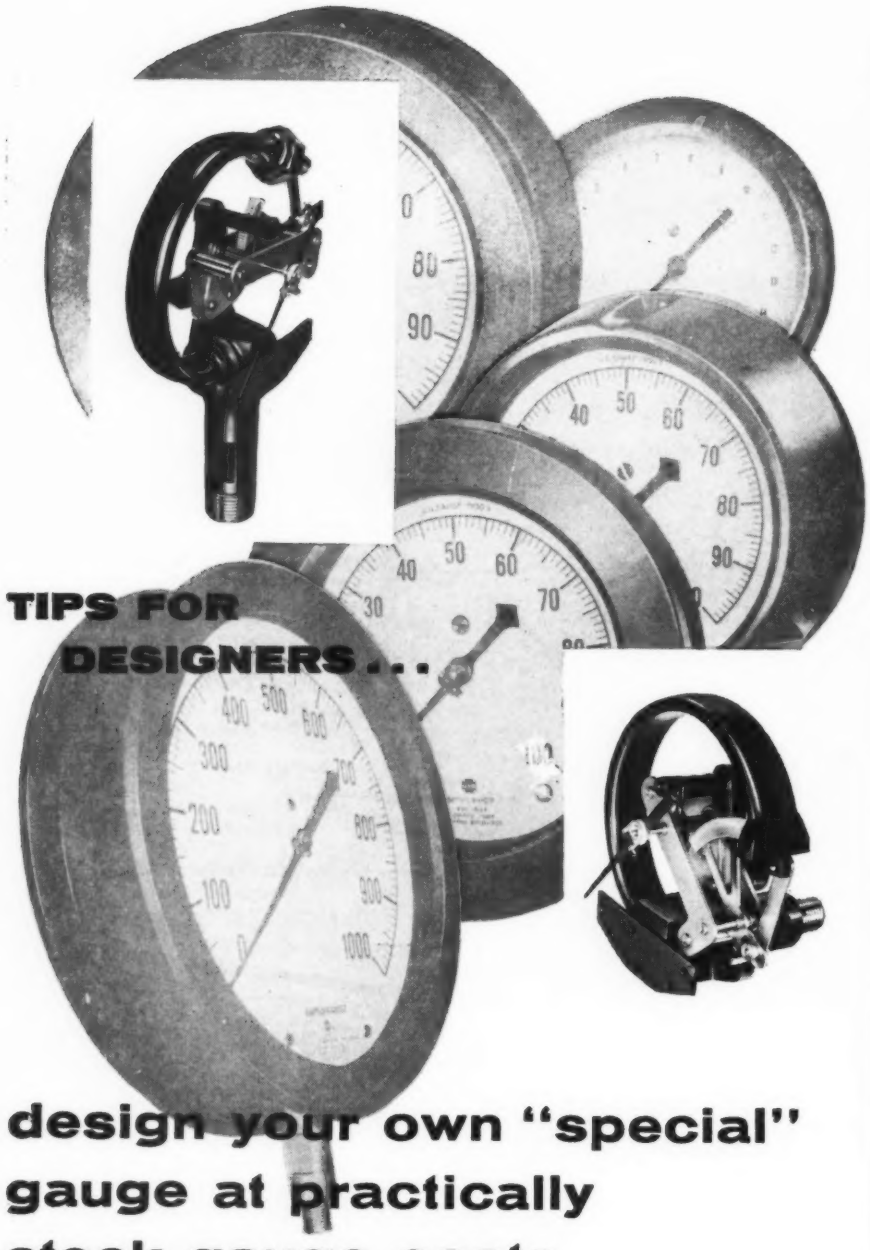

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Williamson, Jr., and the other "Building an Engineering Library," by Professor Hyde. Each issue of CONSULTING ENGINEER as it comes along seems more interesting than the previous one.

Harry Terry
Consulting Engineer
New York, N. Y.

Correction

Sir:

A correction on page 150 of the March 1957 issue is indicated. This is under the only project listed for Mississippi. This should read:

Hedrick, Harte and Kuyrkendall, Atlanta, Ga. U. S. Naval Auxiliary Air Station, Meridian. $30,000,000 (not $30,000). Client, U.S. Navy.

The firm of Hedrick, Harte and Kuyrkendall is an associate of three firms. This association was formed to design the . . . Station.

The first name represents Hedrick and Stanley, who have architect-engineering offices at Fort Worth, Dallas, and Houston, Texas. This is no doubt the largest architectural-engineering firm in the Southwest, and is now on the second billion dollars worth of architecture and engineering design.

The second name represents the John J. Harte Company, of Atlanta, Georgia.

The third name represents Roy C. Kuyrkendall and Associates in Civil Engineering [sic], of Laurel, Miss.

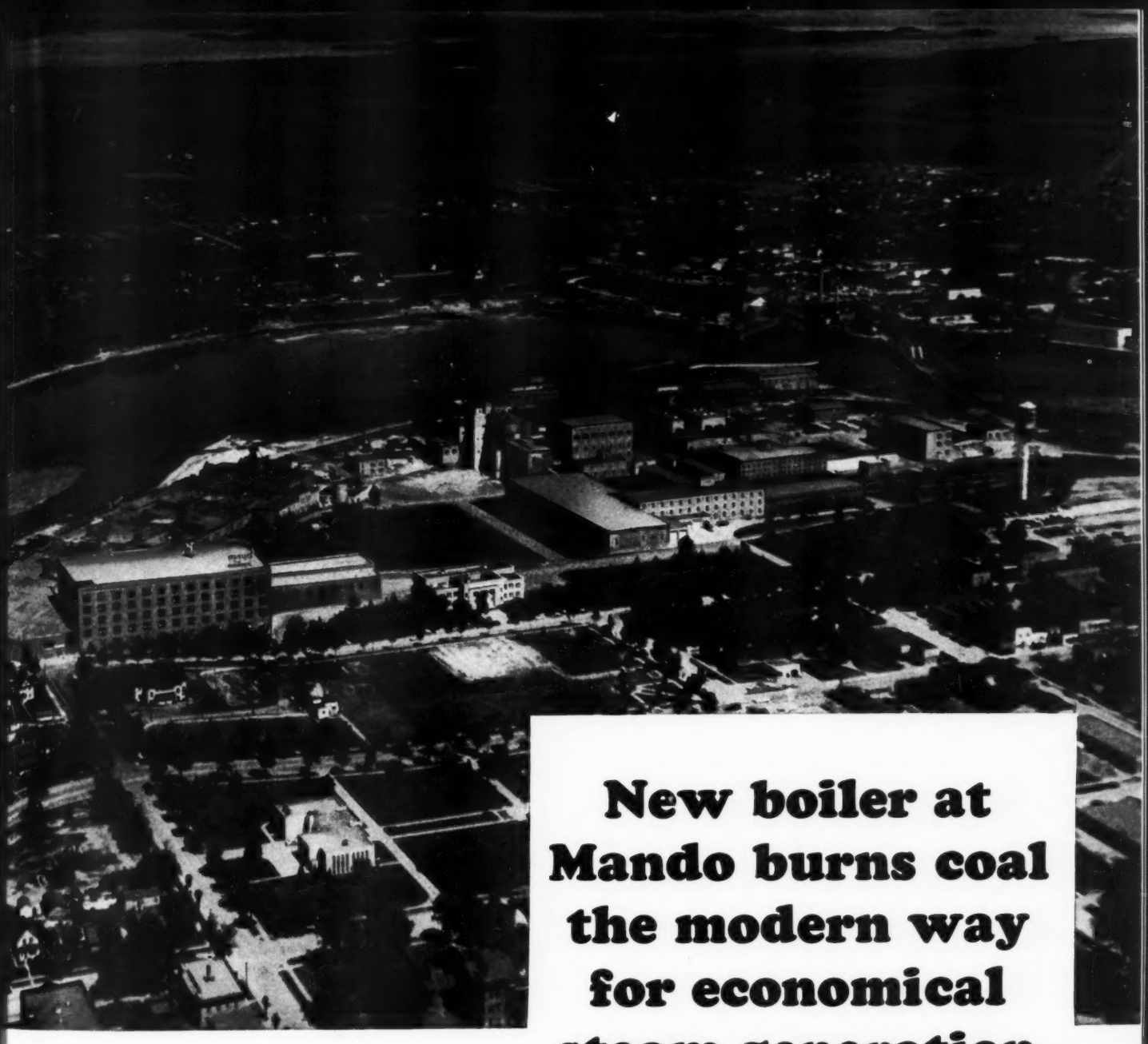
I was formerly chief mechanical engineer at the Hedrick and Stanley Fort Worth office. I am at present chief mechanical engineer for Hedrick, Harte and Kuyrkendall. I am now just a "beat up" old mechanical engineer in his forty-third year of continuously trying to maintain his sanity under the present-day high pressure conditions.

Robt. N. Wagener
Hedrick, Harte and Kuyrkendall
Atlanta, Ga.

Word from Italy

Dear Sir:

The article by Mr. J. J. Polivka ("Precast Concrete Comes of Age") published in the January issue of CONSULTING ENGINEER is most interesting not only for American technicians. As it is well known, due to the expensiveness of steel construction, Italy during the past decades has used almost exclusively concrete structures. In this field, many Italian engineers, starting with P. L. Nervi, have distinguished them-



New boiler at Mando burns coal the modern way for economical steam generation

Mando—the Minnesota and Ontario Paper Co.—is keeping pace with continuing production expansion. The firm recently installed in its plant at International Falls, Minn., one of the largest modern single-pass boilers in the pulp and paper industry. It is designed to produce 240,000 lbs. of steam an hour, bringing the mill's steam generating capacity to 960,000 lbs./hr. The new boiler has 22,500 sq. ft. of heating surface and required 300,000 lbs. of steel in its construction. It will use 775,000 gallons of water a day and, for economy, will burn pulverized coal as a primary fuel—300 tons daily!

For further information or additional case histories showing how other plants have saved money burning coal, write to the address below.

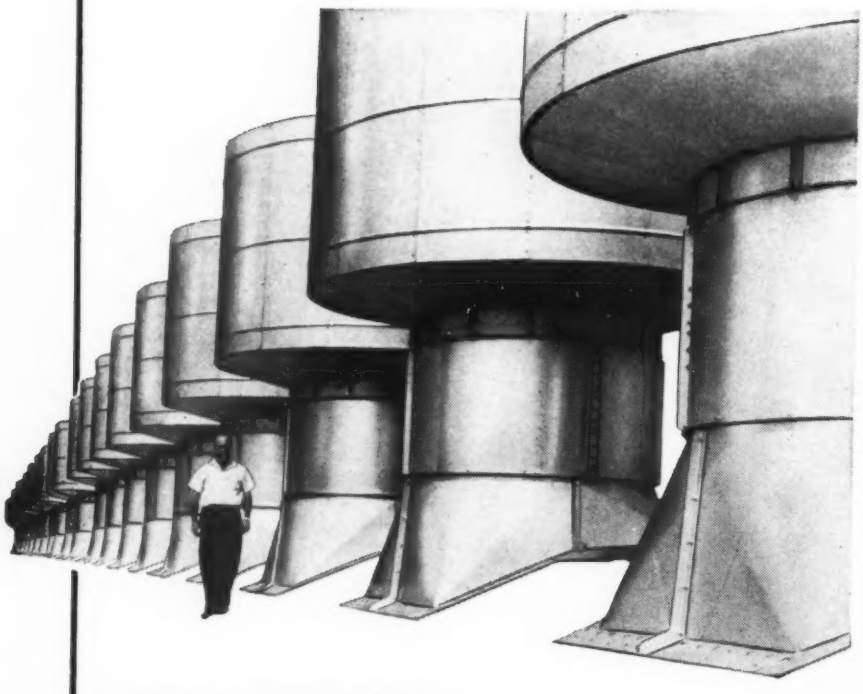
BITUMINOUS COAL INSTITUTE
Southern Building • Washington 5, D. C.

Note to consulting engineers:

Many companies planning a new power plant, or the remodeling of a present one, consult an engineering firm on its design and construction. When you have such a project, our Engineering Department will be glad to assist you in your fuel cost survey with any coal information you may require. In most cases, for the reasons listed below, the use of coal results in substantial savings in increased efficiency and fuel economy through the years.

facts you should know about coal

In most industrial areas, bituminous coal is the lowest-cost fuel available • Up-to-date coal burning equipment can give you 10% to 40% more steam per dollar • Automatic coal and ash handling systems can cut your labor cost to a minimum. Coal is the safest fuel to store and use • No smoke or dust problems when coal is burned with modern equipment • Between America's vast coal reserves and mechanized coal production methods, you can count on coal being plentiful and its price remaining stable.



29 BURT FREE FLOW FAN VENTILATORS DO DOUBLE DUTY ON THIS STEEL PLANT

In this large steel plant, huge volumes of fumes and heated air must be exhausted during certain operations—lesser amounts during other production. Twenty-nine 72" Burt Free Flow Fan Ventilators with individual capacities of 81,000 CFM meet both needs efficiently. Burt Axial Flow cast aluminun fan wheels powered by 15 HP, 860 RPM Class B insulated motors, with shrouds and ventilating tubes, supply adequate air movement at peaks. At other times, their high wind band design provides extremely high air handling capacity as a gravity unit without the fan operating. If YOU need fresh air at low cost, let the Burt line suggest Burt Ventilators to meet your specifications.

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selves. Precast concrete has been used often. However, I believe that Prof. Polivka's contribution can be a stimulus for a larger and more scientific application of it. Prof. Polivka is very well known in Italy, as he worked here before going to the U. S. His ideas for the Pisa Tower have been discussed with great interest by many of the Italian engineers.

I would like, therefore, to have your permission to publish a translation of this article in the magazine *L'architettura* which I edit.

Bruno Zevi, Editor
L'architettura
Rome, Italy

• PERMISSION GRANTED.

Our Oversight

Sir:

Since September last we have failed to receive CONSULTING ENGINEER magazine. Upon checking with your New York office, it was suggested that we write to you so that we may again receive this magazine regularly.

We would also appreciate receiving the October, November, and December issues of 1956 to complete our files.

M. Doty, Secretary
Committee on Engineering Laws
New York, N. Y.

For Reference

Sir:

. . . We just started our firm September 1, 1956 and are in need of the information [in CONSULTING ENGINEER each month] for our technical reference files.

We enjoy the magazine very much and feel it is one of the best we receive and is the best in its field.

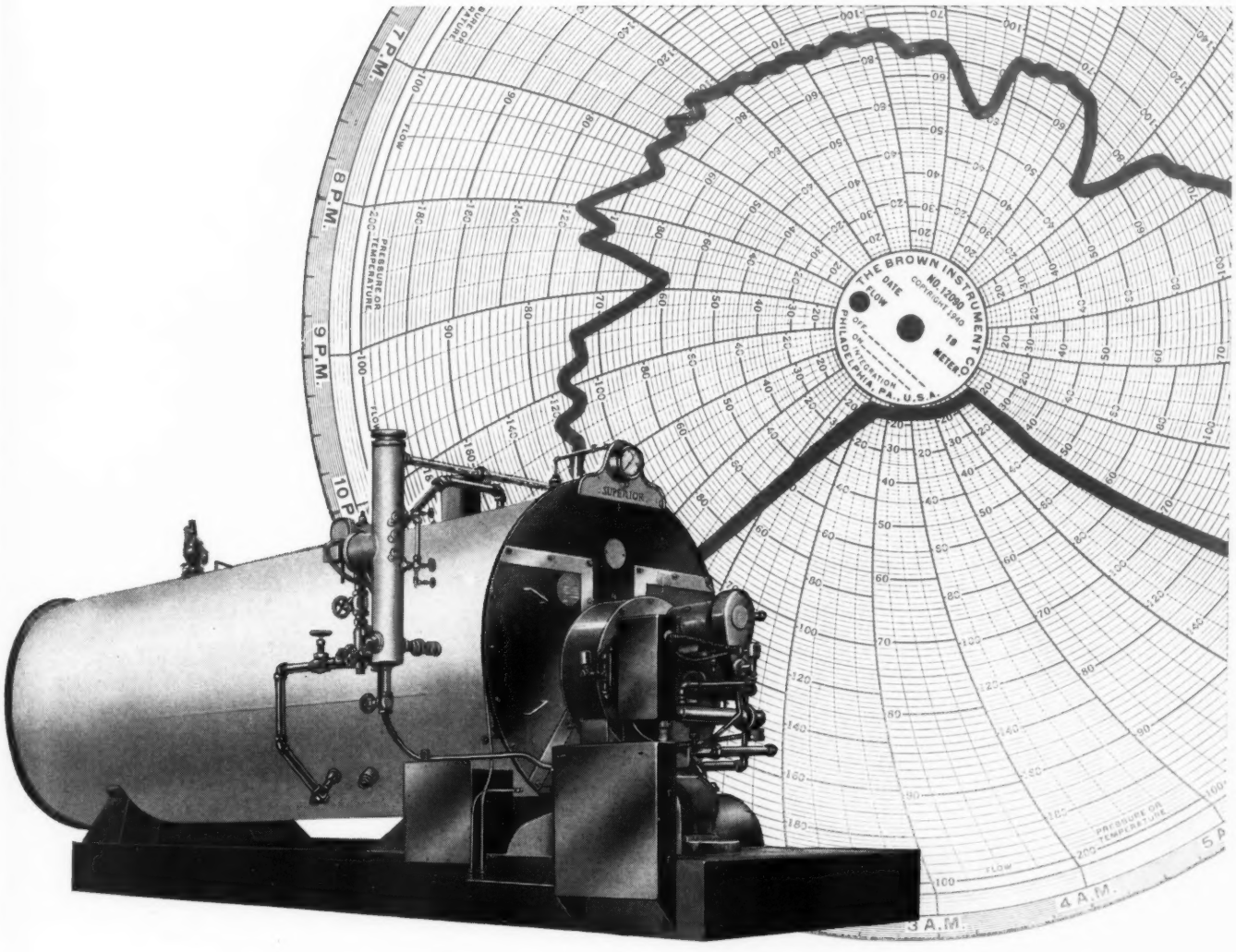
John W. Smith
Consulting Engineer
Hays, Kans.

We Thank You

Sir:

On behalf of the Consulting Engineers Council, may I offer you our congratulations on your very excellent reporting of the Directors Meeting, held in Atlanta, Ga., February 7th to 9th.

However, there was one important decision reached which you, no doubt inadvertently, omitted. It is that the directors voted to set up a Consulting Engineers Council Group Errors and Omissions Policy. This would follow the same principles as the present group policy held by the



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New York Association of Consulting Engineers and will result in very considerable annual premium reductions for members of member associations of the Council.

The final details of this policy are now being worked out by the Council's Professional Committee and it is believed that the policy will be in effect within the next two or three months.

John K. M. Pryke, Pres.
Consulting Engineers Council
New York, N.Y.

Granted

Dear Sir:

Having had to battle the subscriber to your magazine for a chance to read each issue, I am forced to write this letter to you. He has a rather restricted viewpoint and contends the word "read" in my lexicon means "cut out and file." As you do have some articles which are worth saving, I would greatly appreciate a gratuitous subscription in my own name . . .

Earl B. Lichten, P.E.
Neiler, Rich & Bladen
Chicago, Ill.

Taxes and Earnings

Sir:

In your December, 1956 issue of CONSULTING ENGINEER on Page 26 under the heading of "Recommended Reading," you note that the Machinery and Allied Products Institute has recently produced a study entitled "Effects of the New Tax Depreciation Methods on the Earnings of Depreciable Assets." Will you please advise me where I might obtain two copies of this article.

Paul E. Hall
Administrative Vice President
Wyatt C. Hedrick Engineering Corp.
Houston, Texas

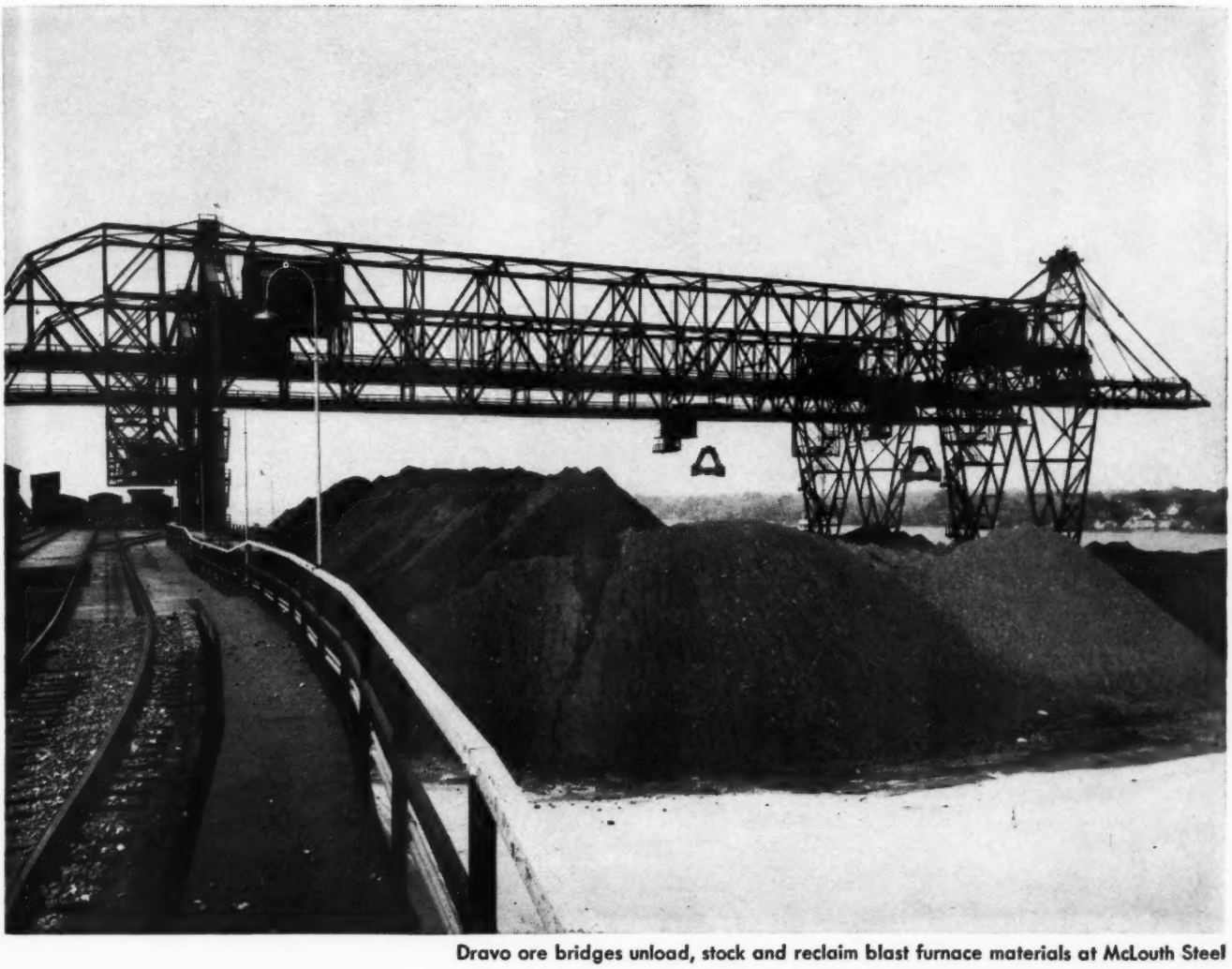
• ADDRESS OF THE INSTITUTE IS 1200 18TH ST., N.W., WASHINGTON, D.C.

Appreciates Accuracy

Sir:

I have read the article in the March issue of CONSULTING ENGINEER on the World Bank and the IFC. I think it is of great value for our story to be told in a publication such as yours, and I particularly appreciate the accuracy of your story. . .

R. L. Garner, Pres.
International Finance Corp.
Washington, D. C.



Dravo ore bridges unload, stock and reclaim blast furnace materials at McLouth Steel

Why only ORE BRIDGES at McLouth's Trenton Mill?

At many steel plants the unloading, stocking and reclaiming of blast furnace materials are divided into two separate handling operations. Unloading is done by one machine, stocking and reclaiming by another. Unloaders and bridges work together economically when several furnaces are operated.

This is not always the case. A plant that has only a few furnaces can realize substantial savings by building one machine to perform both operations. That's what McLouth did. At their Trenton mill these two modern bridges—designed and built by Dravo—unload, stock and reclaim ore, limestone and other blast furnace materials. Each bridge, with a 12-ton bucket, can move over 1,000 gross tons per hour from ore boat to the yard stockpile.

Does this represent a cost savings? You *bet* it does.

Could this type of structure save money for you? It would cost nothing for Dravo engineers to study your operation with you. Such a survey will quickly show where and how your materials handling costs can be reduced. Simply call us at Pittsburgh, SPalding 1-1200, or write to Dravo Corporation, Neville Island, Pittsburgh 25, Pa.

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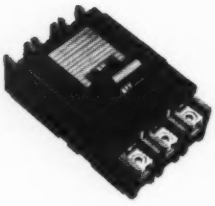
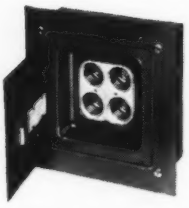
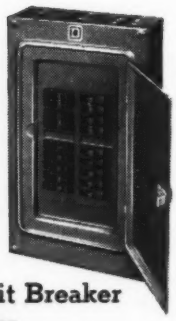
Blast furnace blowers • boiler and power plants • bridge sub-structures • cab conditioners • docks and unloaders • dredging • fabricated piping foundations • gantry and floating cranes • gas and oil pumping stations • locks and dams • ore and coal bridges • process equipment • pumphouses and intakes • river sand and gravel • sintering plants • slopes, shafts, tunnels • space heaters • steel grating • towboats, barges, river transportation

• Safety Switches and Industrial Circuit Breakers

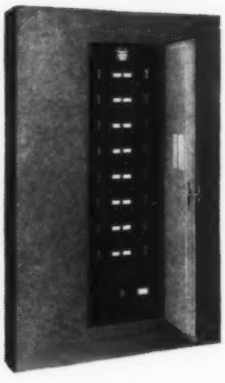






• Fusible and Circuit Breaker Load Centers

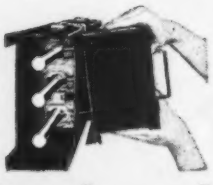
• Voltage Testers



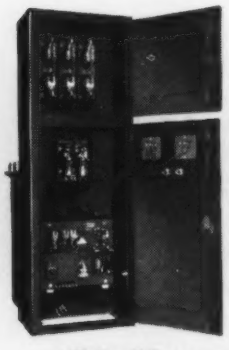
• Fusible and Circuit Breaker Lighting and Power Panelboards

• Power Distribution Switchboards and Switchgear

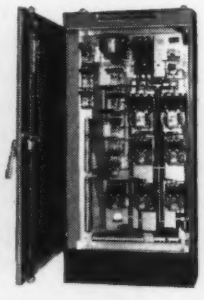
Wherever Electricity



• Busways and Wireways



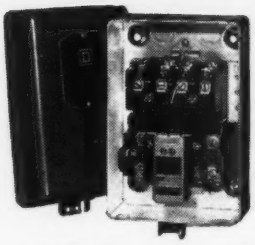
EC&M High Voltage and Synchronous Starters



• Special Purpose Control

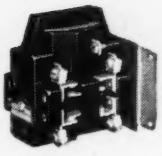
• Control Centers

SQUARE D COMPANY

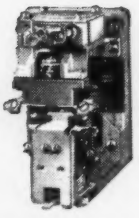


• A.C. Manual and Magnetic Starters

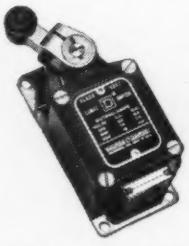
• Drum Switches



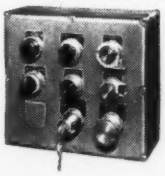
• Control Relays



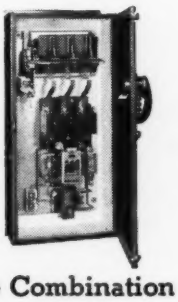
• Timing Relays



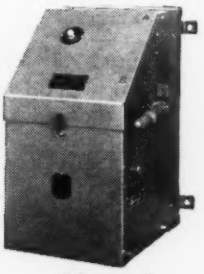
• Limit Switches



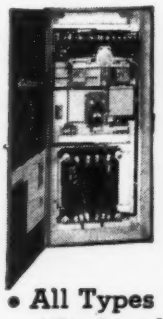
• Pushbuttons



• Combination Starters

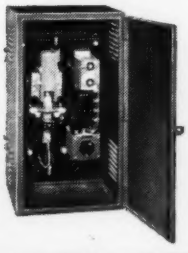


• Manual Compensators

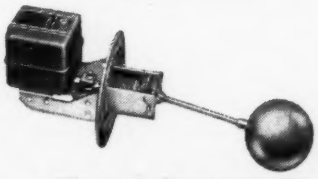


• All Types of Reduced Voltage Starters

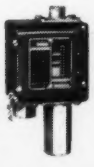
• D.C. Starters



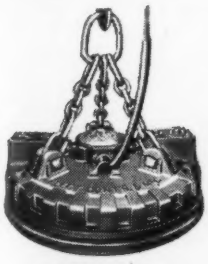
• Electronic and Electro-Magnetic Welder Control



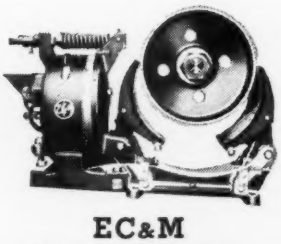
• Float & Pressure Controls for Pumps & Compressors



is Distributed and Controlled



EC&M Lifting Magnets



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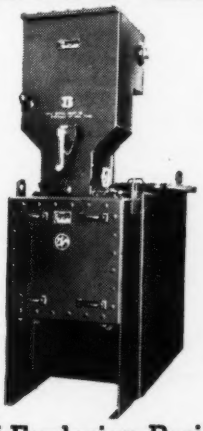
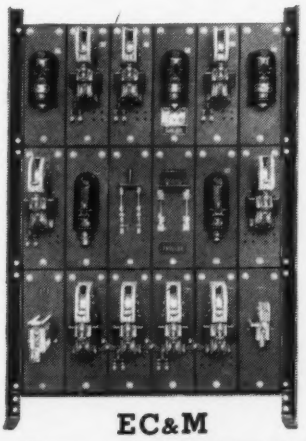


EC&M Explosion-Resisting Control for Petroleum Industry



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JUDGE WALTER E. HOFFMAN is the United States District Judge for the Eastern District of Virginia. The Judge has a faculty rare among jurists. He seems to understand the private practice of engineering. He recognizes it as a profession dealing in services rather than as some commerce or trade. On January 28 of this year, he rendered a wise opinion pleasing to engineers in private practice.

The case involved is Civil Action No. 2070, James P. Mitchell, Secretary of Labor, Plaintiff, v. Lubin, McGaughy and Associates, Defendants. Lubin, McGaughy and Associates is a partnership of consulting engineers and architects with a principal office at Norfolk, Virginia, and with a branch office at Washington, D.C. The partners are also associated with foreign nationals in France and Italy. It is strictly an engineer-architect firm and has never engaged in contracting for construction.

This firm has about 30 employees in the Norfolk office and about 20 in Washington. These employees are engaged in preparing drawings, plans, and specifications.

The complaint brought against them by the Secretary of Labor alleges that they violated certain sections of the Fair Labor Standards Act relating to the overtime and record keeping provisions.

Consulting engineers are familiar with this type of suit. There are two well known cases somewhat similar to this one. One is McComb v. Turpin; the other Mitchell v. Brown. In the first of these, the court decided that the consulting engineers were not involved in production of goods but only dealt in services and therefore did not come under the Wage and Hour provisions of the Fair Labor Standards Act. In the Brown case, the District Court came to much the same conclusion, but the case was appealed, and in the appellate court, the decision of the District Court was reversed, the decision being that consulting engineers do come under the Act. This was appealed to the Supreme Court, but the Court refused to review it.

The Brown case was accepted reluctantly by consulting engineers as the last word on the subject.

In the recent Lubin, McGaughy trial, the government contended that there had been an erroneous decision by Judge Chesnut in McComb v. Turpin, and that even if the decision was not erroneous, it had been modified by Mitchell v. Brown. Judge Hoffman disagreed with this argument of the government lawyers. He held in favor of the defendants, Lubin, McGaughy and Associates. He held that none of the defendants' employees were engaged in the production of "goods" for commerce within the meaning of the Act, and therefore they did not come under the Act.

Judge Hoffman so much as says that if the engineer comes under the Act as one engaged in interstate commerce, then so does the lawyer, the doctor, and any other professional man. Since they do not, neither does the engineer.

Judge Hoffman showed a clear understanding of this when he stated in his opinion,

> Congress may determine to broaden the scope of the Fair Labor Standards Act to include all persons remotely connected with interstate commerce. Stenographers and law clerks or apprentices in legal offices may ultimately come within the Act, as their daily work requires them to handle correspondence, legal briefs, and other documents which are continuously being forwarded across state lines. When such a point is reached, the Act will be all-inclusive and the employees of every business or profession will be subject to its provisions.

Notice that Judge Hoffman, in this paragraph, is making a direct comparison between the law office and the engineering firm. This is important, for it is not that the engineer objects to paying employees at a fair rate but that he objects to being classified under the Act as a producer of goods or a tradesman rather than a professional man. Judge Hoffman, in his law office analogy, and throughout his whole opinion, demonstrates his recognition of the consulting engineer as a professional man offering professional service in the manner in which a lawyer offers services.

If this decision is not appealed, it, along with the McComb case will do much to over-ride the Brown decision and establish the consulting engineer as a professional man. ▲▲

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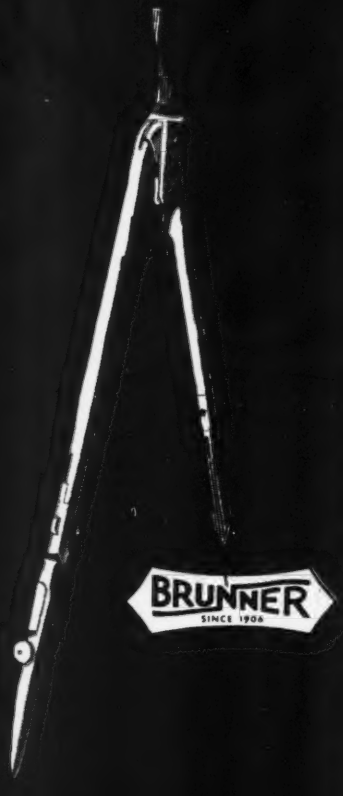

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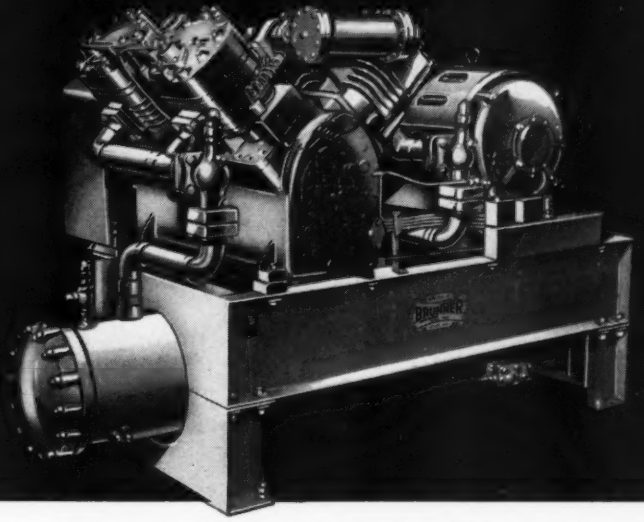

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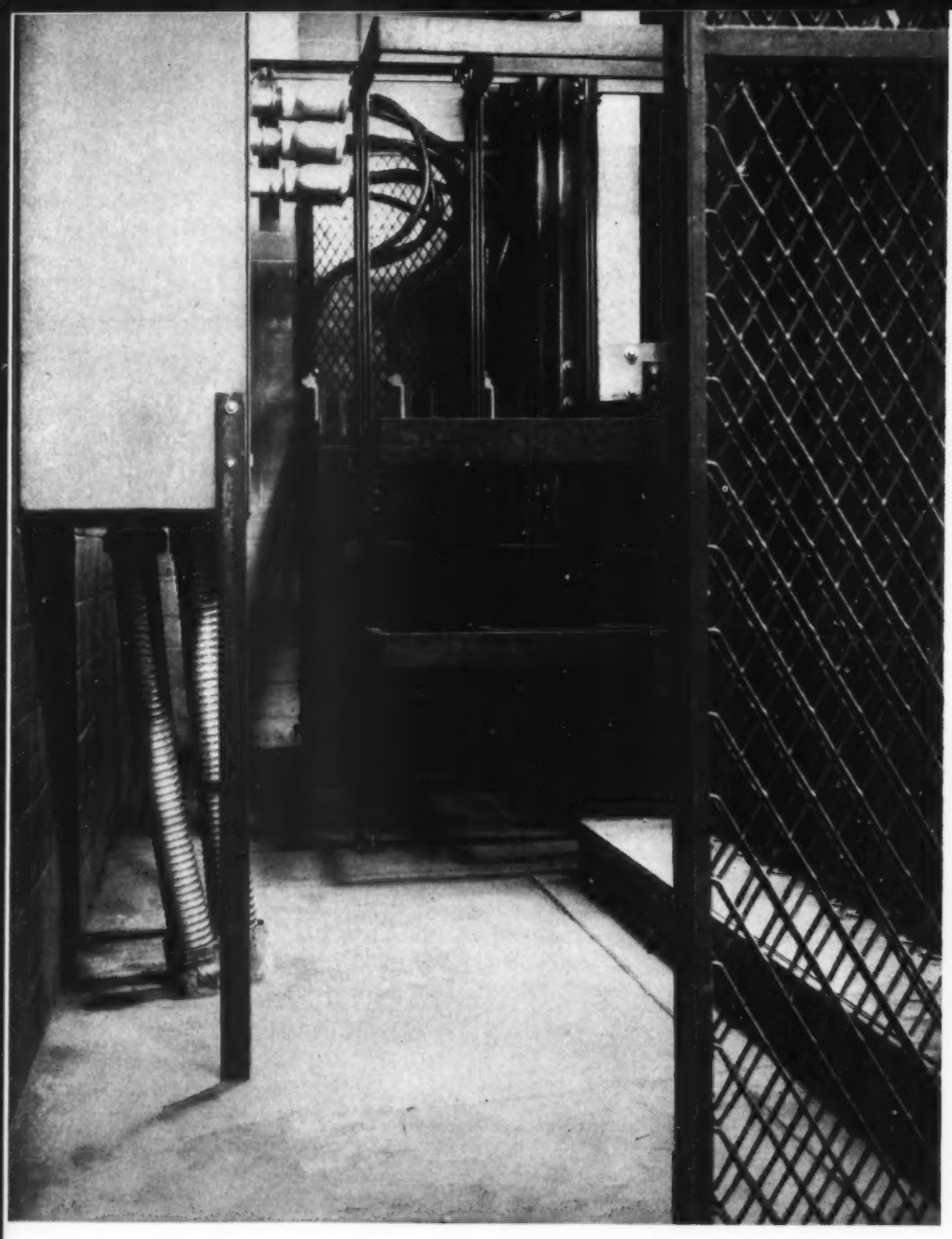

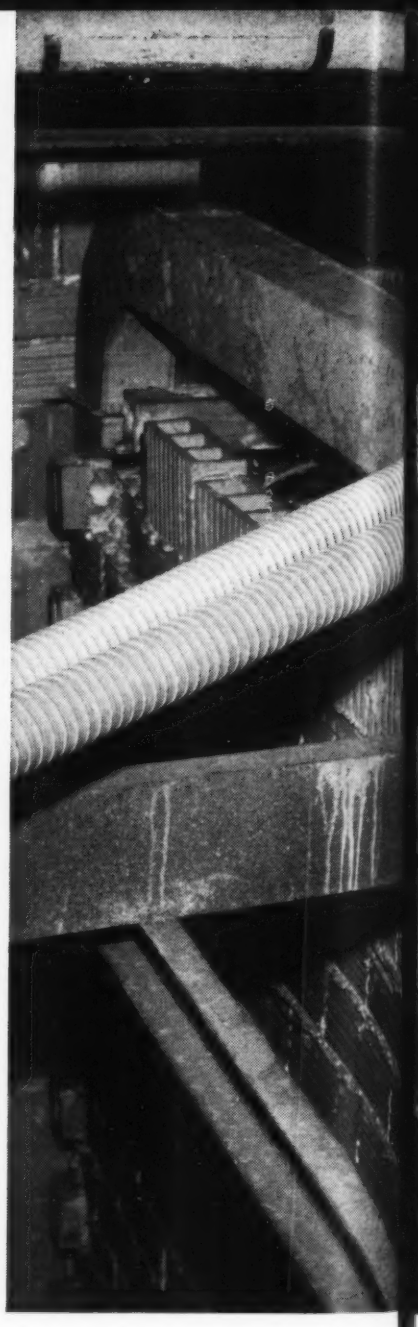

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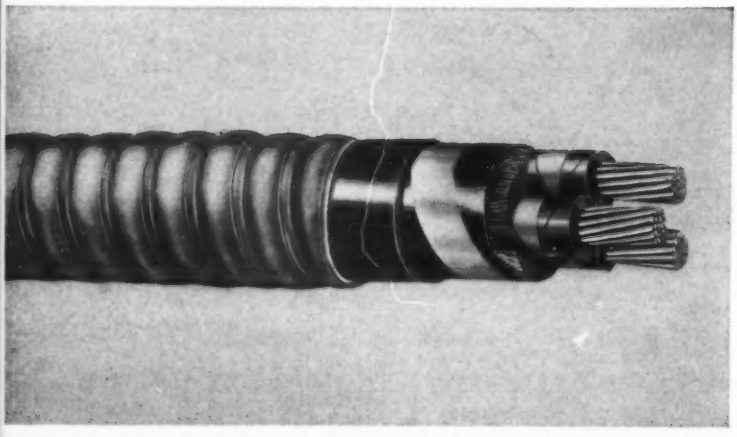

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Installing new circuits in an old building – whethe
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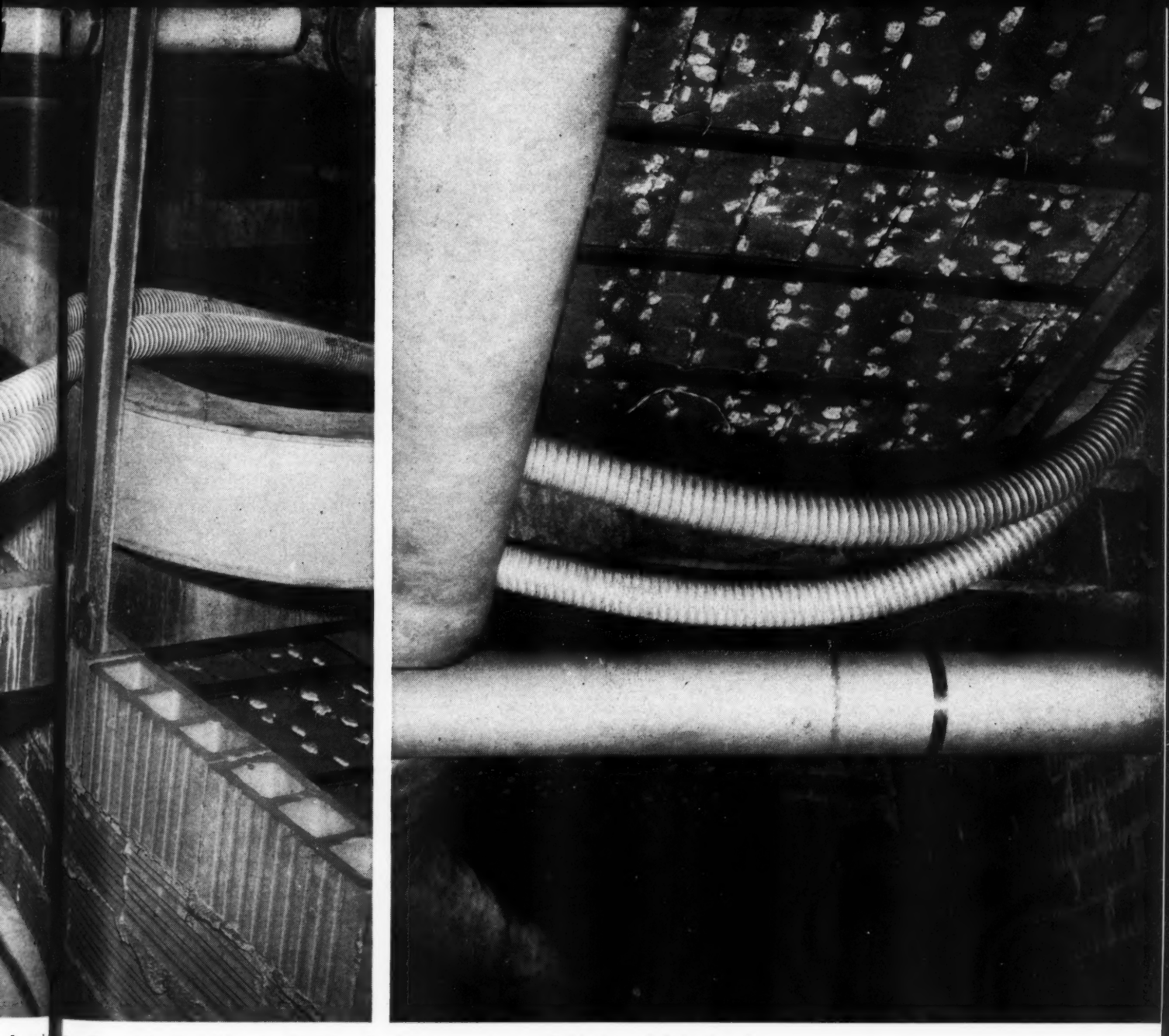

handle new load. Cable runs from breaker box in west wing (left) through loft of roof enter) to side wall of building and down wall (right) to breaker box on lower floors.

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The Word *from* Washington

EDGAR A. POE
Consulting Engineer Correspondent

PERHAPS there has never been such a grass roots demand for slashing the budget and reducing federal spending. Many congressmen are advising their constituents that they will vote to cut the budget sharply.

Nevertheless, the cold, hard facts are that expenditures will not be reduced much. Even if Congress failed to appropriate a single dollar for the 1958 fiscal year, tremendous carryovers of unused appropriations would permit about $70 billions to be spent.

Apparently the only way to obtain an all-out curb in spending would be for Congress to repeal some of the government's spending programs. As long as they are on the statute books, the government's role is fixed.

THERE is a mild drive underway on Capitol Hill to reduce individual income taxes. At this time chances of action are not bright for any kind of cut, but the picture could change later in the session. A 10-percent cut would mean a treasury loss of $3.5 billion.

DOMESTIC business developments in April and May will be indicative of what to expect throughout the remainder of 1957, economists in government are predicting privately. Meantime, readjustments are taking place in the economy.

There are strong beliefs among qualified sources that 1957 will not be quite as good as 1956, but the economy will still be vigorous at the year's end. When the curtain dropped on 1956, the gross national product had attained an annual rate of $424 billions, an increase of $21 billions, but about half of the increase was nothing more than higher prices.

ALTHOUGH there has been no announcement, a major United States airline is drafting a program calling for the construction of several overseas hotels with American capital.

With civilian jet passenger plane service looming for 1959, the current scheduled flying time will be cut in half. Some of the experts in the Nation's Capital are predicting that people in this country within a few years will be flying to Europe and back on long week-ends.

THE hearings into labor racketeerings could result in Congress considering some curbs on powerful labor unions. However, any restraining proposals considered would evoke controversy.

THE Eisenhower administration's school construction bill has little chance of passage this year. There is dissatisfaction among proponents of the measure because poorer states would get a larger share of the money and the richer states a smaller share.

There are other reasons why the bill has tough sledding. Some Southern states, though they would like to have construction funds, are fearful that once Uncle Sam got his foot in the door, he would soon be telling the states and the school districts how the money should be spent. The South wants no part of controlled spending.

Meantime, construction during the current school year will provide 69,200 new class rooms (30 pupils to the room). This would offer new facilities for nearly 2.1 million new students. It is estimated that about 1.1 million new students will be enrolled in the public school systems this year.

DURING the early years of the greatest highway construction program in the world's history, receipts and expenditures are going to be higher than was originally thought at the time Congress was considering the bill a year ago. Thus, a revision of estimates is being made by the Treasury Department because of the fast start of the program.

The over-all total receipts and expenditures for the fiscal years 1957 through 1972, however, will remain about the same as in the original estimates. Total estimated federal expenditures under the revision is listed at $38,533,000,000, with $25,135,000,000 going to the interstate system and the remainder to the primary, secondary, and urban systems.

DESPITE all of the attacks directed at the 27½-percent depletion allowance in connection with the oil and gas industry, there is no chance of the allowance being changed at this session. It is felt that this tax incentive will result in discovery of more reserves during the next three years.

whether it will be built in Nebraska at all.

DETAILED DESIGN has been started on a 20,000-shaft-hp pressurized water reactor for commercial ship propulsion. Gibbs & Cox Co. have been designated marine architectural engineers and a construction contract is under negotiation with the Babcock & Wilcox Co.

AMERICAN GAS & Electric Group and eleven other utilities have notified AEC that they propose to build a small prototype reactor having a heat output of about 50,000 kw (roughly equivalent to 13,000 electrical kw). Three types under consideration are: a graphite suspension reactor with ceramic fuel elements; a liquid metal cooled, natural uranium heavy water reactor; and an advanced type sodium cooled, graphite moderated reactor with ceramic fuel elements. If the prototype looks promising, a full scale power reactor of up to 200,000 kw will follow.

THE EURATOM committee, which visited the U. S. for advice on the size and nature of the power reactor program the six participating nations (Belgium, France, Germany, Italy, Luxembourg, and the Netherlands) should follow, has adopted as an objective the stabilization of fuel imports in the early 1960's. To meet this goal, nuclear power plants with a total capacity of 15 million kw would be necessary within the next ten years.

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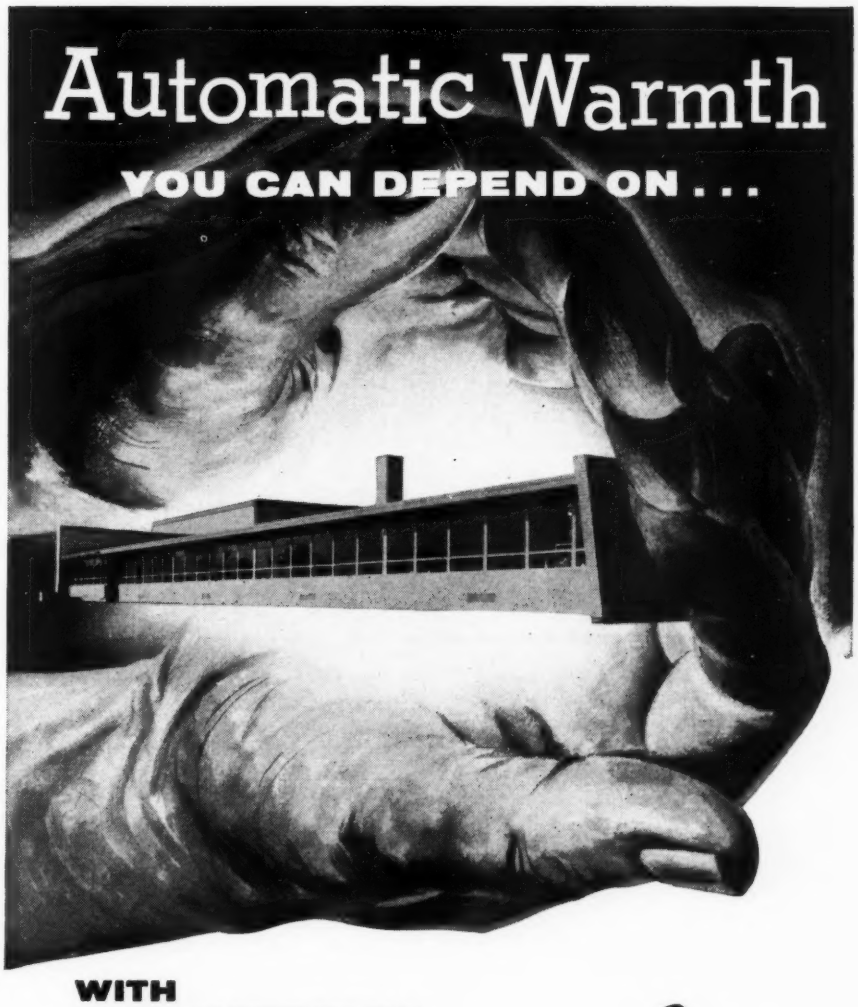
TWO DISADVANTAGES of thorium oxide as a reactor fuel — low thermal conductivity and low resistance to heat shock — are overcome by inclusion of short metal fibers, according to studies underway by Armour Research Foundation for Argonne National Laboratory. Stress-rupture testing of vanadium base alloys at 650 C also shows promise for possible use of the material in construction of reactors operating at higher temperatures and pressures.

NORWEGIAN industrial, maritime, and financial firms have been invited by their government to sponsor establishment of a new company, to be called A/S Noratom, which will market Norwegian technical and industrial know-how in nuclear power



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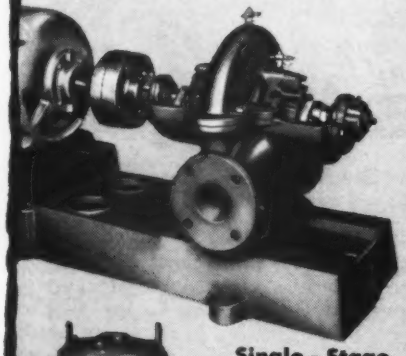

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development. Initially, the company will concentrate on parts and plans for nuclear reactors and will later branch out into construction and operation. Consulting assistance will come from the Norwegian Institute for Atomic Energy.

THE BELGIUM FIRMS of Electrorail, Electrobel, Sofina, and Traction et Electricite have formed a new company that will act as architect-engineer on nuclear projects, including evaluation and design of nuclear power plants.

SOUTH AFRICAN Minister of Economic Affairs A. J. van Rhijn has estimated his country's reserves of uranium ore at 1.1 million tons, with a uranium content of 370,000 tons. Present investment in uranium refining facilities in S. A. is about $160 million.

SITE for the first General Conference of the International Atomic Energy Agency will be in Vienna, Austria. The Preparatory Commission hopes that enough governments will ratify the statute in the near future to make it possible to hold the meeting this year.

BRITISH INSURANCE companies, including Lloyds, have established an atomic energy insurance syndicate known as the British Insurance (Atomic Energy) Committee. The French Federation of Insurance Corporations also has established an atomic risk insurance pool consisting of about 100 companies.

A RUSSIAN nuclear powered icebreaker ship said to be under construction will be powered by a pressurized water reactor, have a speed of 18 knots, displacement of 16,000 tons, and a 44,000-hp engine.

AEC's Technical Information Service has established a service under which its personnel will search AEC's collection of reports and supply specific data or lists of pertinent reports. Cost is $6 an hour.

PLANS FOR an atomic powered airplane seemed to be hugging the ground with the remark by Defense Secretary Charles Wilson that an A-plane "still is in the imaginative stage" and "needs a miracle or two" to get it in the air.

APRIL CONFERENCES on peaceful uses of atomic energy include: the National Nuclear Instrumentation Conference, Instrument Society of America, Atlanta, Ga., April 10-12;

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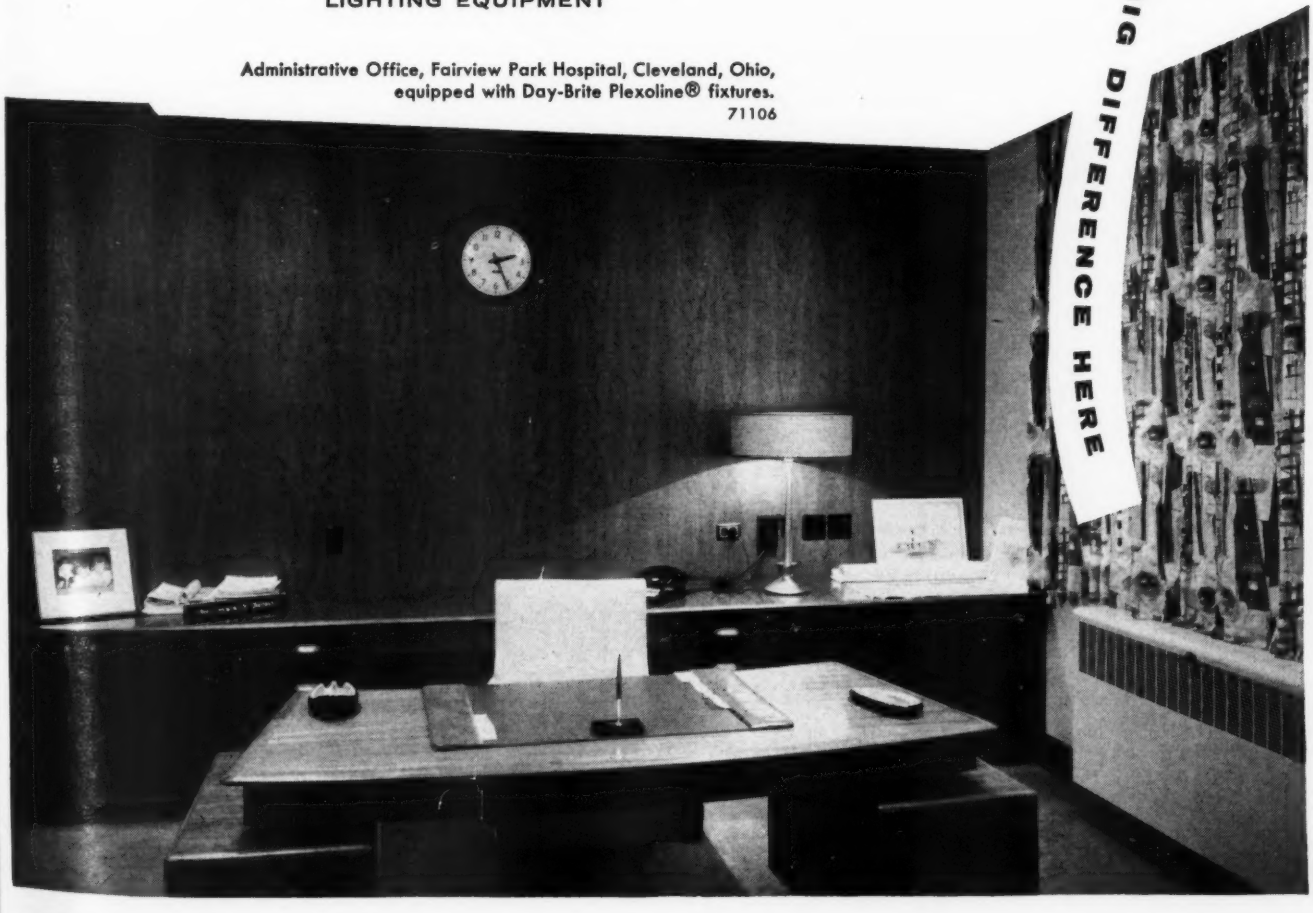
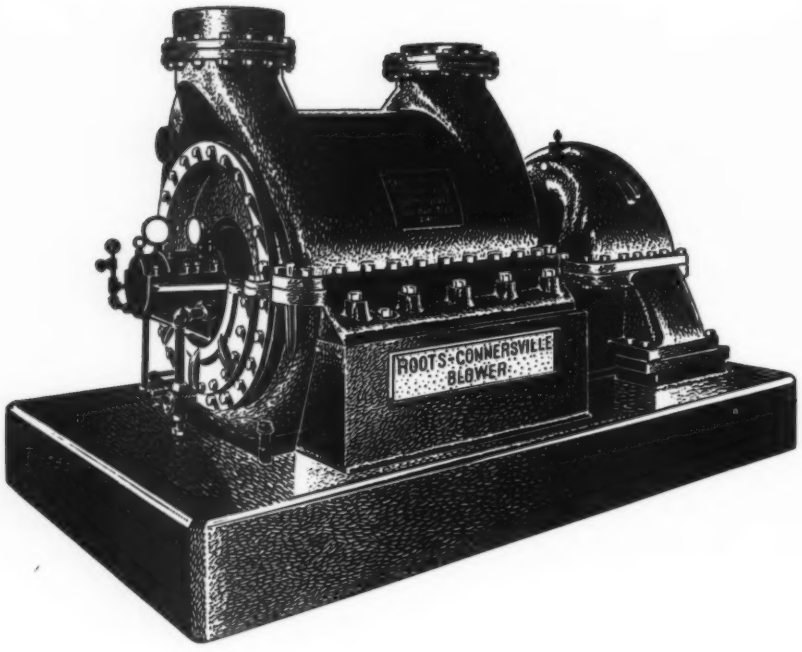




R-C centrifugal blowers assure accurate control of volume and pressure

At any speed, Roots-Connersville centrifugal blowers assure uniform delivery of air or gas without the use of receivers. In matching supply to changing demand, this inherent operating advantage simplifies accurate and instantaneous control of volume and pressure.

R-C centrifugals may be direct-connected to high speed electric motors or turbines. Operating speeds may be further raised with speed increasing gears. Occupying a minimum of space and perfectly balanced, with semi-rigid bearing supports to dampen vibration, they do not require special, costly foundations.

Liberal design of diffuser and return passages results in low velocities, normal efficiency even when build-up occurs and exceptionally quiet operation. Operating without internal lubrication, oil-free air is discharged, making it ideally suited for exacting process applications. For complete specification details, write for Bulletin 120-B-14.

ROOTS-CONNERSVILLE BLOWER

A DIVISION OF DRESSER INDUSTRIES, INC.

357 Wilson Ave., Connersville, Indiana. In Canada — 629 Adelaide St., W., Toronto, Ont.

and the Symposium on Engineering for Nuclear Energy, New York University in cooperation with ASME, at Gould Student Center, University Heights Campus, April 13.

A FREE WORLD market of 19 million kw during the next ten years was forecast by Michael Michaelis, of Arthur D. Little, Inc., in a speech before the American Management Association. Of this, the U. S. would take about 2.5 million; Great Britain, 5 million; Europe and Japan, 10 million; underdeveloped countries, 1.5 million. He expects American industry to supply 35 to 40 percent of the equipment used by these foreign markets.

AEC has announced plans to submit proposals to this session of Congress for amending the Atomic Energy Act in the fields of indemnification, state vs federal responsibility regarding health and safety, AEC authority to guarantee foreign buy-back plutonium prices and U. S. services such as chemical processing, and AEC authority to make long-term commitments related to its program in such fields as fuel and chemical processing.

U.S. Chamber of Commerce has issued what they call an "emergency policy declaration" saying that construction of large-scale experimental atomic power plants should be by industry with government research and development and low cost fuel help. On the other side of the fence are the American Public Power Association, the AFL-CIO, and the Rural Electric Cooperative Association as proponents of the Gore Bill, which would authorize the Government to build various types of power reactors.

AEC has asked Congress for new appropriations totalling $202,450,000 for plant acquisition and construction. Of this, $9 million is for a power reactor in Puerto Rico, $5 million is for a "Project Sherwood" plant, $20 million for acceleration of power reactor development, $9 million for a classified "testing installation," $10 million for a fuel technology center at Argonne, and $5 million for a fuel fabrication plant.

GODIVA, AEC's stripped down reactor at the Los Alamos, N. M., test site, used to experiment with critical assemblies, exploded Feb. 12 while being used as a source of neutrons for the instantaneous irradiation of uranium loaded graphite. The reactor building was not damaged but the reactor is considered beyond repair. The accident was not reported

50-foot-long section of Armco Welded Steel Pipe being lowered into a trench at Cumberland, Maryland. It is part of a 5-mile water line to an industrial area.

Consulting Engineer:
Robert T. Regester, Baltimore

City Engineer:
Charles R. Nuzum

Special Design Engineer:
W. E. Piper

Contractor:
The Cumberland Contracting Company

Armco Pipe Saves City 21.7% on Industrial Water Line

To supply water for the Pittsburgh Plate Glass Company's new plant being completed near Cumberland, Maryland, the city built an 18-inch-diameter water pipe some 26,500 feet long.

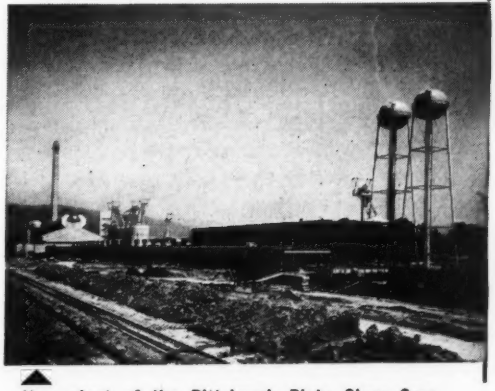
Originally, four types of water pipe were considered, but choice narrowed down to Armco Welded Steel Pipe and a rigid metal pipe. When bids were opened, it was found the *Armco Pipe was 21.7% below* the lowest of three bids submitted on the competitive pipe.

Most of the Armco Pipe was supplied in 50-foot sections. This meant fewer sections to haul and handle—fewer joints to assemble. The contractor completed the job ahead of schedule.

For any water line—industrial or municipal—you will find Armco Welded Steel Pipe offers you more advantages. It is supplied in exact 50-foot lengths in diameters from 6 to 36 inches; and in wall thicknesses from $\frac{9}{64}$- to $\frac{1}{2}$-inch. Outside coatings meet AWWA specifications and a spun enamel lining will prevent tuberculation.

Ask us for data. Armco Drainage & Metal Products, Inc., Welded Pipe Sales Division, 4017 Curtis Street, Middletown, Ohio. Subsidiary of Armco Steel Corporation. In Canada: write Guelph, Ontario. Export: The Armco International Corporation.

Problem of installing the water line under a railroad without disturbing the fill was solved by jacking through casing of corrugated metal pipe.



New plant of the Pittsburgh Plate Glass Company of Pittsburgh, now under construction at Cumberland. It will be served by the Armco Pipe water line.

ARMCO®

ARMCO WELDED STEEL PIPE

They Looked....and Located

In B&O's LAND of BIG OPPORTUNITY

● *A new or expanded plant every 30 hours during the last 15 years!* That's the remarkable record of industry's confidence in B&O's Land of Big Opportunity. The reasons are clear. *This area* is the nation's *top market*, embracing about *half* its population—that means workers and customers. Natural advantages plus continual power-growth and availability of special raw materials provide a production-right scene for modern industrial operations.

B&O's *plant-location experience* assures industry executives *realistic* counsel on site selection. *Look where a site is production-right* . . . let B&O show you *on the ground*, or at your desk using modern airviews plus 3-dimensional color.

THERE'S A PRODUCTION-RIGHT SITE FOR YOU TOO!
Ask our man!

B&O's Plant Site Men Are Located At:

BALTIMORE 1.....Phone:.....LExington 9-0400
NEW YORK 4.....Phone:.....DIgby 4-1600
PITTSBURGH 22....Phone:.....COurt 1-6220
CINCINNATI 2.....Phone:.....DUnbar 1-2900
CHICAGO 7.....Phone:.....WAbash 2-2211

THIS SPECIAL STUDY ON REQUEST
From the B&O Railroad, Baltimore 1, Md.

BALTIMORE & OHIO RAILROAD

Constantly *doing things* —better!

until March 15, after evaluation of the cause.

PACKAGE CONTROL mechanisms for nuclear research reactors have been developed by two engineers, Gilbert Rolan and Charles Hinrichs, according to a paper presented before the 1957 Nuclear Congress. The package is made up of standardized components, each designed to perform a specific function. By combining the components in various ways many different types of drive mechanisms can be assembled. This should mean considerable savings in money and time since up to now controls for each reactor were designed and fabricated separately.

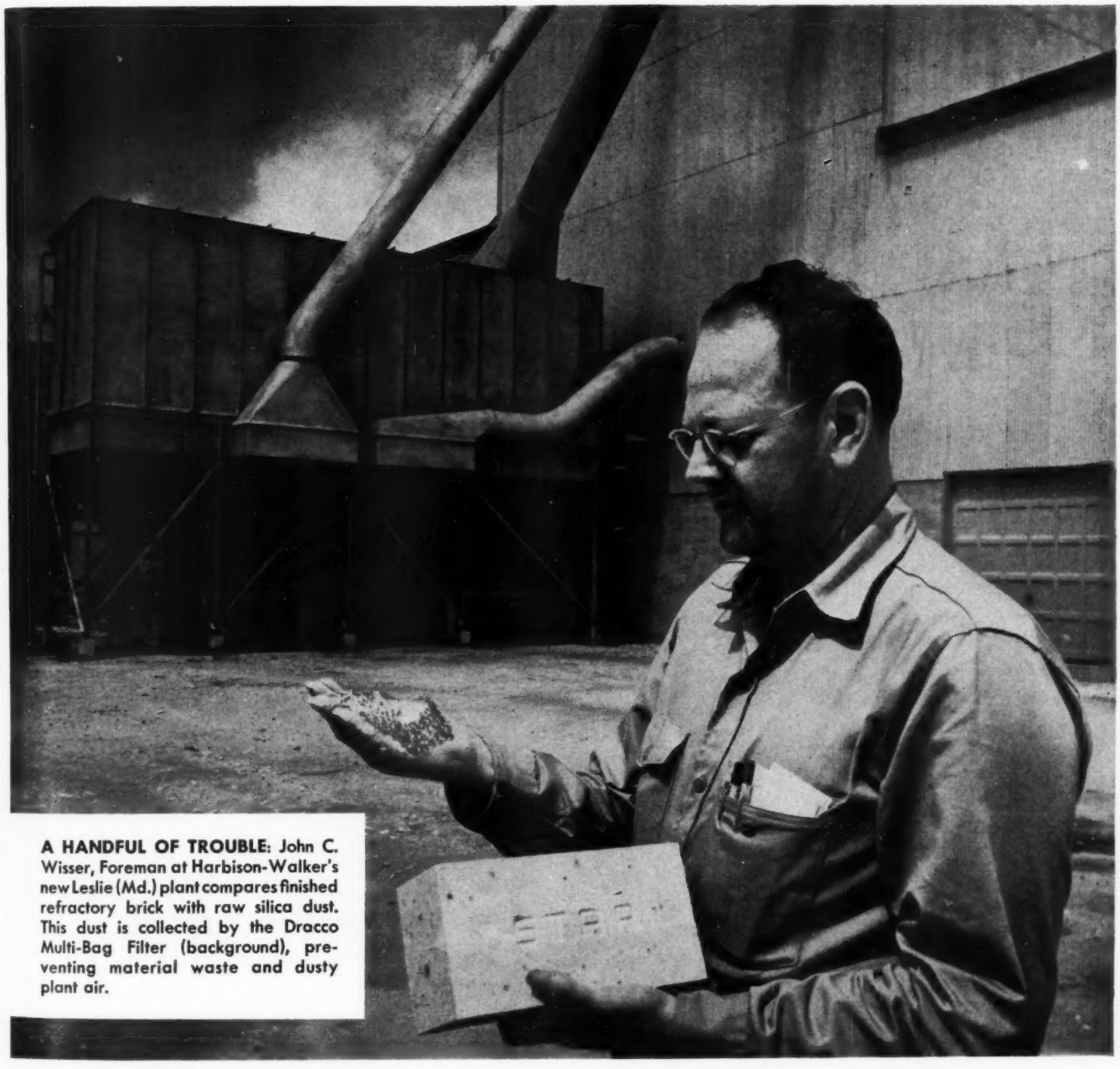
ONE MILLION curies of cobalt-60 per year will be produced by the boiling water reactor planned by Isotope Products, Inc. It will also yield 50,000 lbs of steam per hr, which IP hopes to sell to a pulp and paper mill. Site will depend on which of several paper companies being approached on the idea says yes. Design is underway by General Nuclear Engineering.

STUDIES at the Corps of Engineers' Ohio River Division Laboratory have shown that radioisotopes may be employed successfully to measure moisture content and density of soils for engineering purposes. Testing involves use of a portable nuclear soil meter developed by the Laboratory.

STRUCTURAL WORK on Shippingport's radioactive waste disposal plant accounted for almost 40 percent of the cost for the entire disposal plant. Tanks and pipes could not be buried directly in the ground or imbedded in concrete because of possible radiation leakage into ground water. These components instead had to be placed in vaults with space around them for monitoring.

Expert Witness Reprint

Robin Beach's five articles on "The Engineer as an Expert Witness" are available in a 16-page reprint for $1.00. Please write to: Reader Service Dept., CONSULTING ENGINEER 227 Wayne St., St. Joseph, Mich.



A HANDFUL OF TROUBLE: John C. Wisser, Foreman at Harbison-Walker's new Leslie (Md.) plant compares finished refractory brick with raw silica dust. This dust is collected by the Dracco Multi-Bag Filter (background), preventing material waste and dusty plant air.

Dracco dust control keeps new plants new

There's something exciting about a new plant. It symbolizes the success and progress of your client.

Uncontrolled dust can spoil the picture before you know it: maintenance and cleaning costs rise—machines become worn—efficiency is affected by dirty plant air—valuable material is wasted.

The time to solve dust problems is before the plant is built. Dracco engineers working hand-in-hand with your plant engineering staff can plan a dust control system which will prevent dust from polluting plant air or the atmosphere and keep employees and machinery working like new.

Harbison-Walker Refractories Company is typical of forward-thinking companies who pre-plan for production efficiency. Their new ultra-modern plant in Leslie, Maryland, uses Dracco Dust Control to prevent spread of dust from grinders and belt conveyors.

If any of your present or future projects have potential dust problems, it will pay to look ahead with Dracco.

DRACCO CORPORATION
4030 East 116th Street · Cleveland 5, Ohio

Bulletin 800 is Dracco's 40-page catalog on dust control and recovery. Contains detailed facts and figures on all dust control equipment. For your copy, write Dracco today.

DRACCO *airstream* conveyors
dust control equipment

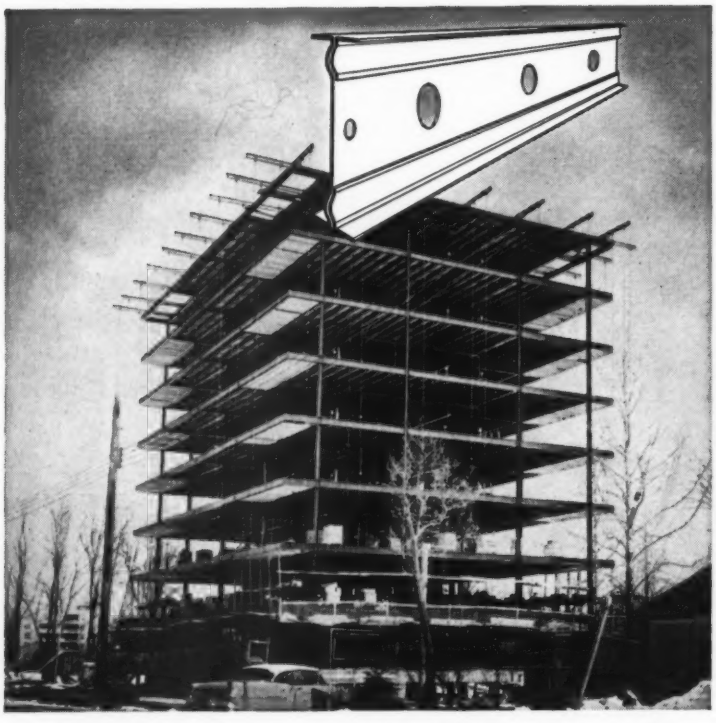
NOW *Stran-Steel offers a complete lightweight* joists, studs, columns, decking

Stran-Steel now offers a complete structural system with fully integrated components—nailable joists and studs, structural columns and beams, roof decking and the beautiful new metal curtain wall panels with *Stran-Satin* finish.

Stran-Steel's complete structural system brings these advantages to the engineer, architect and owner:

VERSATILITY—Many structural variations are possible with this versatile system in the design of walls, roofs, partitions, canopies, floors, even entire buildings. A few are illustrated below.

ECONOMY—Savings in the use of steel architectural products mean more economical construction, resulting in lower bids to fit budget limitations.



Eight-story luxury-type apartment building, New York City. Builder: Alfred Levitt.

New Maximlite-designed Northeast Elementary School, Findlay, Ohio. Design by: John Auferoth.

NAILABLE JOISTS AND STUDS—Stran-Steel joists are light gage steel members formed from strip steel and welded back to back to form the special nailing groove. They provide a non-combustible, economical and permanent framing system to which collateral materials can be quickly and easily applied. Available in 6″, 8″, 9″, 10″ and 12″ depths and in gages of 12, 13, 14 and 16. This range of depths and gages satisfies almost any load requirement.

The distinctive nailing groove permits rapid installation of collateral materials. Ordinary nails can be used and tightly clinched in a grip of steel, yet can be readily removed with a claw hammer.

STRUCTURAL COLUMNS AND BEAMS—Stran-Steel cold formed members are "C" section shapes and are available in special steel having a yield of 40,000 p.s.i. These sections are manufactured in a variety of sizes and can be used in many combinations as structural columns and beams. Stran-Steel cold formed sections are strong and durable, yet provide weight-saving and cost-saving economies. They are available in 8″, 10″, 12″ and 14″ sizes and gages ranging from 6 to 14.

NEW WIDE FLANGE STRUCTURAL SHAPES—Eight choices of wide flange I-section structural shapes are now available. Two with 6″ flange, 8.62″ and 9.62″ in depth; six with 8″ flange, ranging from 8.75″ to 12.75″ in depth.

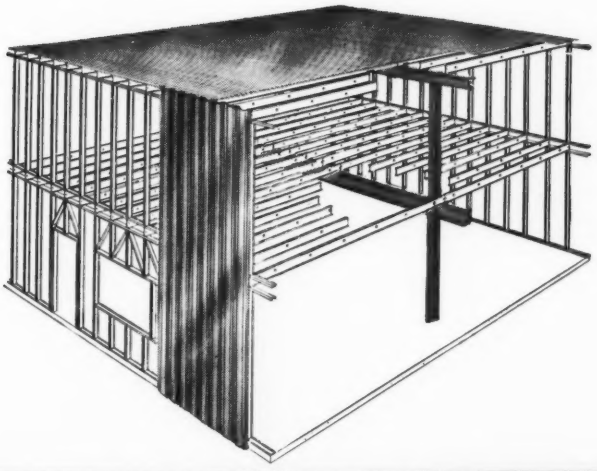
see our catalog in S ARCHITECTURAL FILE or write for copy

Here's where to obtain more information:

Atlanta 3, Ga., 206 Volunteer Bldg.; **Chicago 6, Ill.,** 205 W. Wacker Dr.; **Cleveland 16, Ohio,** 20950 Center Ridge Rd.; **Detroit 29, Mich.,** Tecumseh Rd.; **Houston 5, Texas,** 2444 Times Blvd.; **Kansas City, Mo.,** 6 East 11th St.; **Minneapolis 4, Minn.,** 708 S. 10th St.; **New York 17, N.Y.,** 405 Lexington Ave.; **San Francisco 3, Cal.,** 1707 Central Tower Bldg.; **Washington 6, D.C.,** 1025 Connecticut Ave., N. W.

structural system—

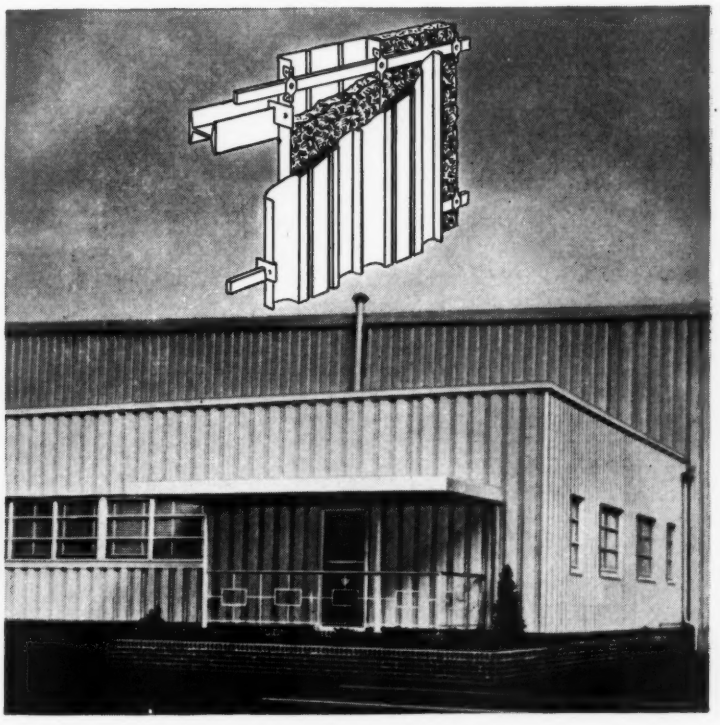
and curtain wall



STRENGTH—Stran-Steel nailable joists, for example, have a yield point of 40,000 p.s.i., approximately 20% higher than that of most commercial mild steel. This extra-strength weight advantage prevails throughout the range of these products.

Stran-Steel products are ideal for schools, apartments, shopping centers and industrial plants.

Cleveland's Parkland, $50,000,000 residential and shopping community. Project developer: Don Loftus. Architect: Wm. E. Harris.



Large, modern warehouse, Oakland, California. Owner: Bigge Drayage Co. Engineers: D. Y. Long Co.

RIBBED ROOF DECK—Stran-Steel galvanized ribbed deck is designed primarily for use with Stran-Steel joists. However it is also useful as sidewall skin in certain applications. Two types are available:

1. Lightweight, nailable roof deck with ribs on 4″ centers. Available in 22, 24 and 26 gage, live load carrying capacities range from 32 to 206 p.s.f., depending on gage, with spans from 2′ to 4′.
2. Heavier roof deck for longer spans has ribs on 6″ centers. Available in 18, 20 and 22 gage. Live load carrying capacities range from 12 to 267 p.s.f., depending on gage, with spans from 3′ to 9′6″.

CURTAIN WALL—Stran-Steel curtain wall, made of exclusive *Stran-Satin* panels, combines a satin-smooth surface free of bright spangles along with the permanent protection of a non-corrosive zinc coating. It provides the low cost of steel with the eye appeal of far more expensive materials.

Stran-Steel curtain wall consists of two basic panels, insulation and concealed fasteners. This wall is quickly assembled on the job simply by using a button punch. Panels are never pierced or marred by bolts, screws, rivets or holes. Curtain wall panels are available in 18, 20, and 24-gage steel, in lengths up to 54 feet.

Stran-Steel

STRAN-STEEL CORPORATION
Detroit 29, Michigan • A Unit of
NATIONAL STEEL CORPORATION

Stran-Steel Corporation, Detroit 29, Michigan

☐ Please send me your new Structural Systems Catalog
☐ Please have your representative contact me

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57-SS-18A 25

The Legal Aspect

MELVIN NORD, P.E.
Consultant in Legal and Technical Problems
Patent Attorney

Atomic Energy Law (Financing)

While a hypothetical atomic corporation is not a foreign country, it is possible that it might qualify for some sort of financial assistance from the Federal Government.

Commission Powers

According to Sec. 31 of the Atomic Energy Act of 1954: "The Commission is directed to exercise its powers in such manner as to insure the continued conduct of research and development activities in the fields specified below, by private or public institutions or persons, and to assist in the acquisition of an ever-expanding fund of theoretical and practical knowledge in such fields. To this end the Commission is authorized and directed to make arrangements (including contracts, agreements, and loans) for the conduct of research and development activities relating to: nuclear processes; the theory and production of atomic energy, including processes, materials, and devices related to such production; . . . utilization of special nuclear material, (and) atomic energy . . . for all other purposes, including industrial uses, the generation of usable energy, and the demonstration of the practical value of utilization or production facilities for industrial or commercial purposes . . . "

No Subsidy

Thus, our hypothetical atomic corporation qualifies for some form of Federal aid in its efforts to develop a commercially feasible type of plant. However, it is not clear what form this aid can take. Sec. 31 simply says "contracts, agreements, or loans." Sec. 169 should be read in conjunction with this (since as we shall see later, we shall require a Sec. 104 license for our plant). Sec. 169 is headed "No Subsidy," and reads as follows: "No funds of the Commission shall be employed in the construction or operation of facilities licensed under Sec. 103 or 104 except under contract or other arrangement entered into pursuant to Sec. 31." While this language is vague, the heading — "No Subsidy" — is clear. We may be able to secure Federal financial aid, but not "for keeps."

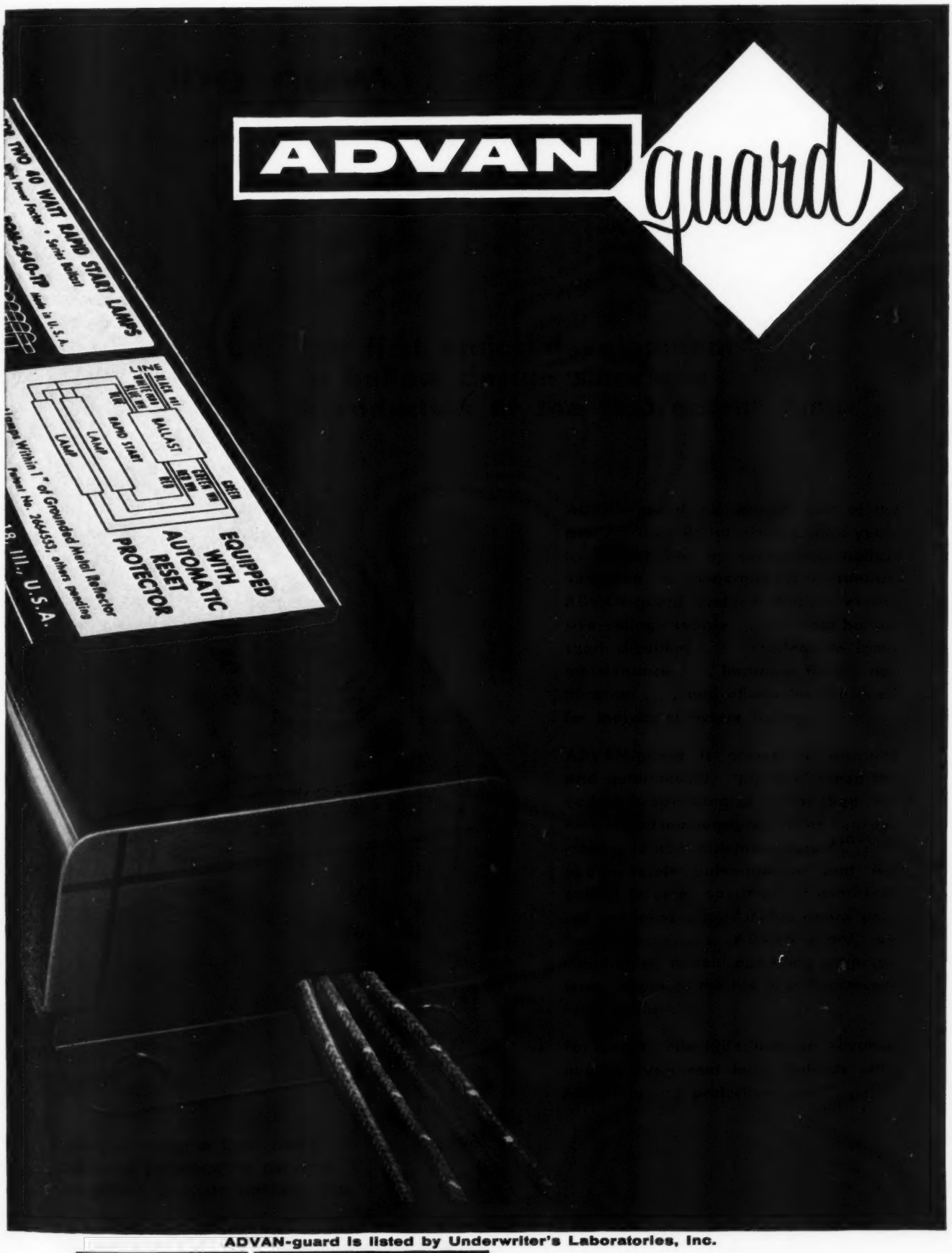
AEC Pays for Research

However, the AEC fortunately has interpreted Sec. 31 and 169 in a somewhat broader spirit. Several full scale private demonstration plants are being built under research contracts, with the AEC paying for "research and development" to be conducted by the licensee. Many millions of dollars of outright grants are involved in these research contracts, on the theory that although the AEC does not have power to subsidize the capital cost of reactors, it does have the power to enter into contracts in connection with the development and construction of new types of equipment and plants.

Indirect Federal Assistance

Regardless of any Federal financing we may be able to negotiate for our hypothetical firm, the bulk of the investment undoubtedly will come from private sources. Therefore, it is worthwhile to investigate briefly the forms of Federal financial assistance which may encourage private financing.

One form of indirect assistance to private financing is found in provisions of the Internal Revenue Code of 1954, which provides a favorable tax climate for pioneer investment, expansion, and risk. One of these (Sec. 167 of the Code) greatly liberalizes allowances for property depreciation by permitting the use of a declining balance method with an annual limit of double the straight-line rate. Sec. 1231 of the Code provides for losses on the sale or abandonment



ADVAN-guard is listed by Underwriter's Laboratories, Inc.

ADVANCE TRANSFORMER CO.

World's Largest Exclusive Manufacturer of Fluorescent Lamp Ballasts

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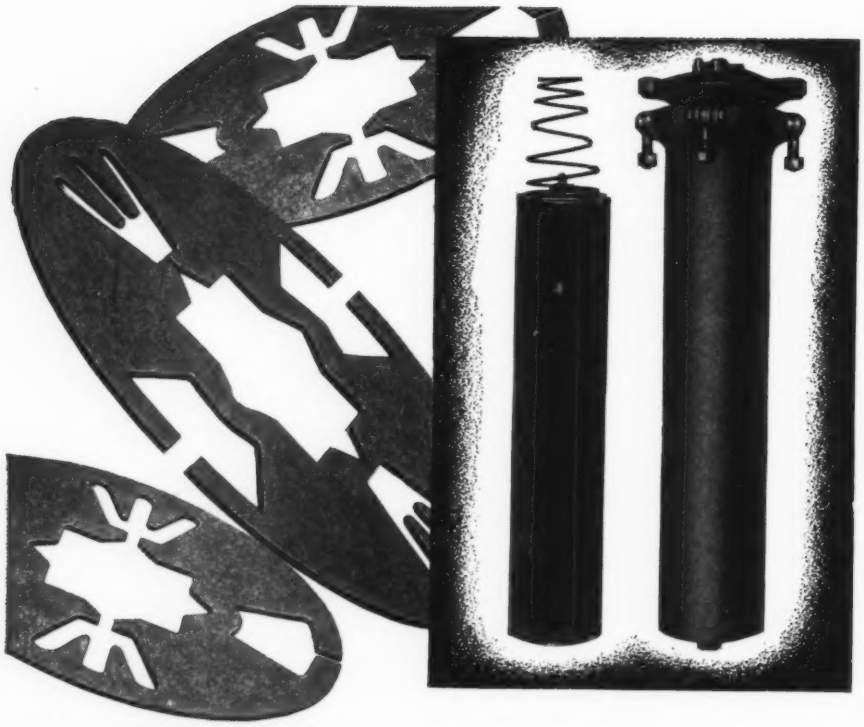
The Heart of the Lighting Industry



the NUGENT Laminated Disc Filter

This "extended area" filter utilizes an actual filtering surface area greatly in excess of its container area. The Nugent Laminated Disc Filter provides a high flow rate at low pressure drop combined with the extreme fine filtering absorption and neutralizing properties of a depth type filter.

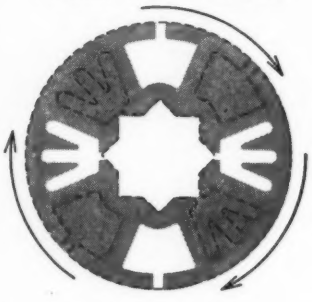
The filter charge consists of a stack of similar crenulated fiber discs, each rotated 45° from the position of the adjacent disc, thus affording proper channeling and maximum filtering capacity. Liquid passes from the exterior to the interior of the filter stack.

The filter recharge has a useful life of from 4 to 10 times that of a cellulose or waste recharge. Changing recharges requires only minutes. Cartridges are interchangeable with all other Nugent bag or depth type cartridges. Write for full details.

DESIGN FEATURES

- Provides "Extended Area" filtering
- Removes solids as small as 2 microns
- Removes acid forming contaminants
- Will not remove additives
- Contains no chemicals or bleaches
- Working pressure 125 psi—tested to 375 psi
- High pressure filters to 600 psi—tested to 3000 psi
- Built in by-pass relief
- Maximum operating temperature 375° F.

HOW IT WORKS



Each disc in filter stack is rotated 45° from position of adjacent disc for proper channeling and maximum filtering capacity.

Established 1897

Wm. W. Nugent & Co., Inc.

3460 Cleveland Street Skokie, Illinois

OIL FILTERS, OILING AND FILTERING SYSTEMS, TELESCOPIC OILERS, OILING DEVICES, SIGHT FEED VALVES, FLOW INDICATORS

Representatives in Boston • Cincinnati • Detroit • Houston • Los Angeles • Minneapolis • New Orleans • New York • Philadelphia • Portland, Oregon • San Francisco • Seattle • St. Louis • Tulsa • Representatives in Canada: Montreal • Toronto • Vancouver

of depreciable property, and is expected to encourage risks. Furthermore, Sec. 174 of the Code provides for the annual write-off of research and development expenses as they are incurred, even though they are of capital nature.

The provisions cited above postpone the payment of Federal income tax. Other provisions of the Internal Revenue Code that reduce tax liabilities include provisions for (1) moderating the double taxation of dividends for small investors, (2) providing capital gain treatment for income received by inventors or their financiers, (3) business loss carryforward provisions, and (4) exemption from the corporate income tax for certain "venture capital" corporations.

United States foreign aid in the atomic field ultimately may prove beneficial to our atomic corporation, since we expect to deal with foreign customers. But this will not be of any help in financing the prototype reactor to be built in the United States. On the other hand, there are some rather complicated patent problems that may have an adverse financial effect. These patents relate to foreign trade in the atomic field.

Sale of By-Products

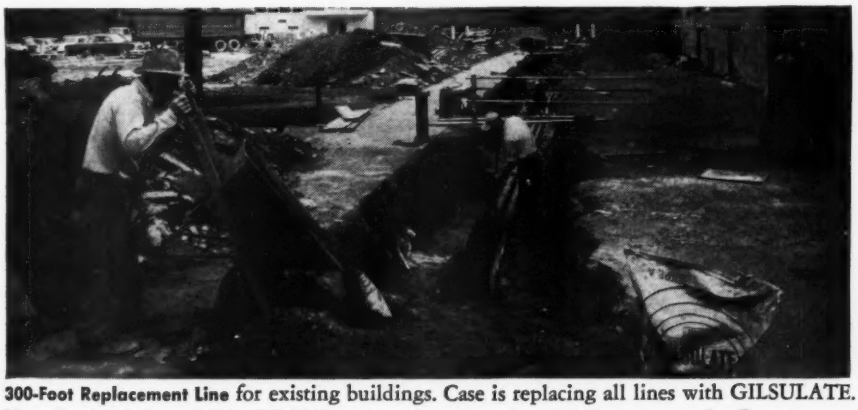
Other double-edged forms of indirect Federal financial assistance include the AEC's broad power to establish prices for special nuclear material (Sec. 53 of the Atomic Energy Act) and the Commission's power to distribute by-product radioactive materials at very low prices, thereby minimizing the chance for private reactor operators to profit from the sale of their by-products (Sec. 81). Although these prices can make or break a private operator, they are not fixed by ordinary economic factors but by the decision of a governmental board.

Thus, when a private party invests money in a reactor, it is really an act of faith in the AEC. This is so to an even greater

Building "A Case for the future"

Cleveland's Case Institute approves GILSULATE® for underground hot pipe insulation

Major Expansion Program at Case Institute, leading Midwest technical center, includes plans for several new buildings. GILSULATE has been used and approved by Case on these projects.

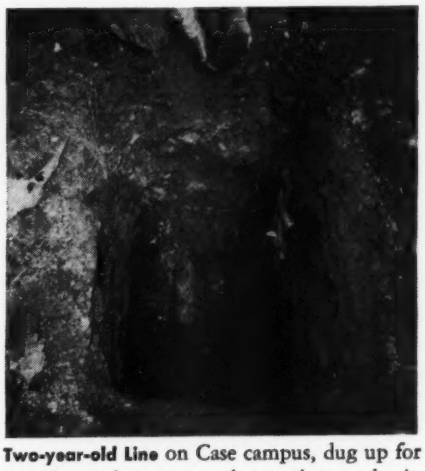


300-Foot Replacement Line for existing buildings. Case is replacing all lines with GILSULATE. Thus far, 1900 feet of GILSULATE-protected steam and return lines are on the Case campus.

Pouring GILSULATE is a simple job. Plywood forms conserve material. This is a close-up of the pipe run shown at the left. No special equipment is required during handling.

Shovel Pointing works GILSULATE between and under the pipes, filling all the voids. GILSULATE is ideal for use under roads and pavements, has a high load bearing capacity.

Tamping is the next step. It firms the GILSULATE bed prior to curing. Backfilling, seen in the overall view, is the final step. Few men are needed on a GILSULATE job.



Two-year-old Line on Case campus, dug up for experimental purposes, shows pipes to be in perfect condition, with intact GILSULATE protective structure.

Facts about Gilsulate

1. EASY TO USE—just pour and tamp...pipe heat does the rest.
2. FORMS 3 ZONES of protection against heat loss and all hazards commonly encountered by hot buried pipes.
3. NEEDS NO HOUSING OR MECHANICAL SHEATHS: no mixing, special handling or equipment.
4. ONLY NEEDS NORMAL PIPE SPACING: for multiple pipe or cramped conditions.
5. THREE TYPES AVAILABLE:
   Type A for 220°-300°F temp. range
   Type B for 300°-385°F temp. range
   Type C for 385°-520°F temp. range

GILSULATE®

The Triple Zone Insulation System for Lifetime Protection of Underground Hot Pipes

Do you receive PIPE INSULATION NEWS? Ask to be put on our mailing list.

For complete information on GILSULATE Insulation, write any of our offices:

AMERICAN GILSONITE COMPANY

Affiliate of Barber Oil Corp. & Standard Oil Co. of Calif.

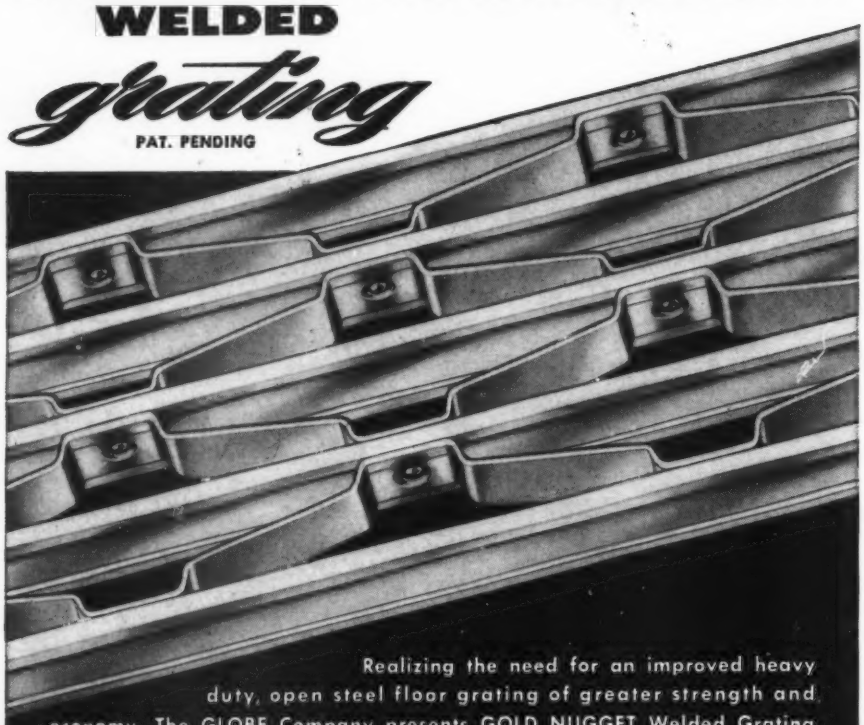
134-M West Broadway, Salt Lake City 1, Utah

3537 Lee Road, Cleveland 20, Ohio

GOLD NUGGET®

WELDED grating

PAT. PENDING

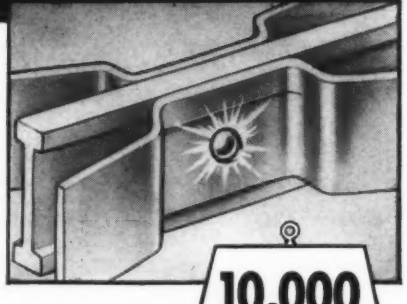


Realizing the need for an improved heavy duty, open steel floor grating of greater strength and economy, The GLOBE Company presents GOLD NUGGET Welded Grating — the first grating to take advantage of modern engineering design. As a result of this improved design, the GOLD NUGGET primary load bar provides 22% more strength with 14% less weight. The primary load bar is a miniature I-beam with all of the advantages of a true structural member.

GOLD NUGGET Welded Grating is recommended for power houses, loading docks, oil refineries, fire escapes, drain grates, plating rooms, filtration rooms and for all types of heavy duty platforms.

GOLD NUGGET

- ★ ⅜" projection weld nugget for greater rigidity and strength
- ★ vertical alignment of the main load bars assured
- ★ all bars are load carrying bars including secondary bars
- ★ anti-skid pattern



PROJECTION WELD

Each secondary load bar (A), as projected welded to the primary load bar (B) has a shear strength of 5,000 pounds per weld. There are 28 such projection welds to a square foot of grating. This means that GOLD NUGGET Welded Grating can sustain greater shock loads than other gratings.

For the complete details of this revolutionary new grating, write for new catalog today. Distributors in all principal cities. Consult the yellow pages in your phone book under "GRATING."

The GLOBE Company

MANUFACTURERS SINCE 1914

PRODUCTS DIVISION

SAFETY GRIP-STRUT GRATING • GOLD NUGGET WELDED GRATING • CABLE-STRUT AND GLOBETRAY CABLE RACEWAYS

4026 SOUTH PRINCETON AVENUE • CHICAGO 9, ILLINOIS

extent than we have thus far illustrated, in view of the broad powers of the AEC to amend, modify, or revoke licenses.

Effect of State Regulations

In addition to the effect of the Federal Government on our financing problem, we also must consider the effect of state laws.

Assuming we are to operate a reactor for the production of electric power, we may be classed as a public utility. In addition to requiring a certificate of convenience and necessity, and being subject to rate regulation, we also may be subject to state regulation with respect to any company security issues. The local Public Utilities Commission may, for example, have the power to require competitive bidding on such security issues. It also may have the power to regulate the proportion of bonds and fixed interest obligations relative to the total capital structure. This may mean that a considerable amount of risk capital (i.e. shares of stock) will be needed. There also may be restrictions on the participation of other companies, including other public utilities, in the project.

It may be possible to escape these problems by disassociating the reactor plant from the electric power generation plant by having the atomic company sell steam to a regular electric company, which will generate power in adjoining facilities. Whether this will work remains to be seen. It is being attempted by one of the companies engaged in building a private reactor, but it is too soon to predict the result. Furthermore, the result may differ from state to state.

Financing our prototype reactor is extremely complicated. Obtaining the necessary financing may require negotiations with the AEC, with private investors, and with a state Public Utilities Commission. Beyond that, construction would be an act of faith in the AEC. ▲▲

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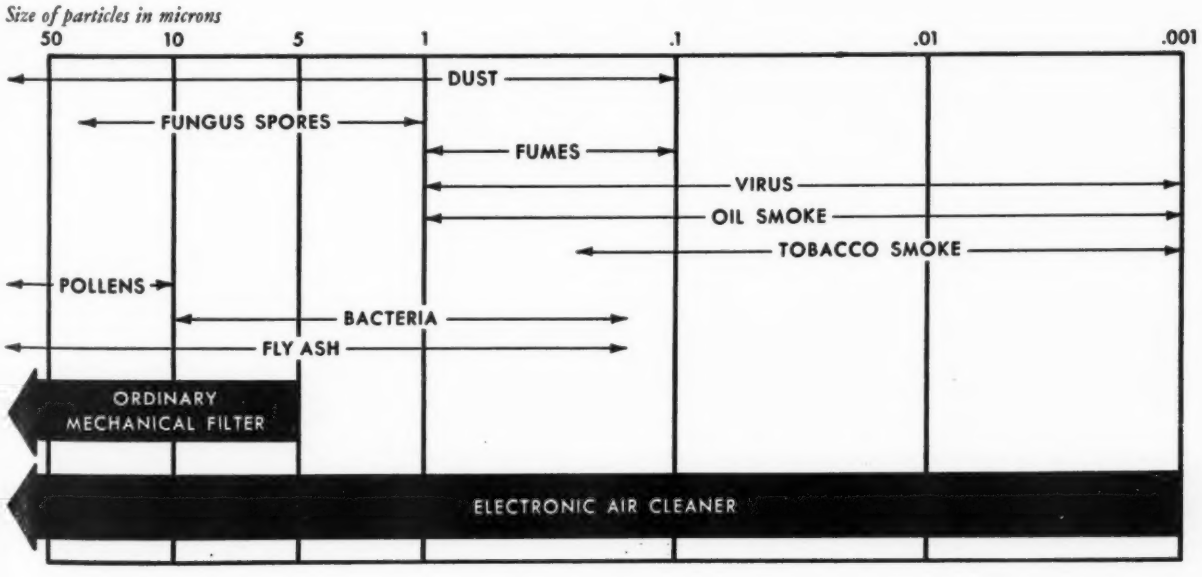

As shown above, common airborne contaminants range in size from beyond 50 to .001 microns. In this area lie dust, pollens, fungus spores, bacteria, fly ash, fumes, oil smoke, virus and tobacco smoke. It should be noted that the ordinary mechanical filter removes very few of the airborne particles of less than 5 microns in size. But notice the wide range of protection offered by the Honeywell Electronic Air Cleaner. Here you get not only the removal of the large coarse particles, but the microscopic ones, as well—a major cause of soiling and many respiratory ills.

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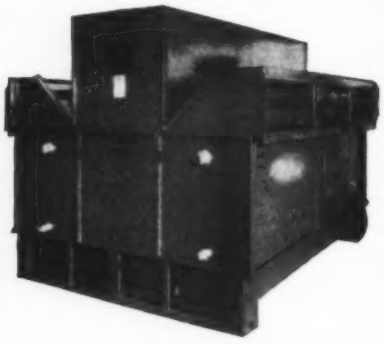

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Report From London

WALTER SEKULES
Consulting Engineer Correspondent

PROGRESS of British consulting engineers and lack of organization in the engineering profession as a whole were discussed at the 1957 annual dinner of the (British) Association of Consulting Engineers, held at the Dorchester Hotel, in London.

The guest of honor, Lord Waverley, congratulated the consultants on the recent growth of their organization.

"I know that for quite a time you were hampered by war-time conditions, but recently you have been making rapid progress," Lord Waverley said. " Your membership has increased from 200 to 430 since the end of the War. Now, I have been interested to have figures showing the volume of work overseas for which members of your association are responsible. At the beginning of 1956, members of your Association were carrying out work abroad to the value of more than £430 million, excluding investigations and reports. That, surely, is a very great figure, compared with the motor industry's total exports for the year of £100 million."

Responding to Lord Waverley's toast to the organization, V. A. M. Robertson, association president, agreed that the term "engineer" has needed definition for some time. He also added that Britain's major engineering institutions are working to promote a proper understanding between parents, teachers, technical colleges, and young prospective engineers. "But I suggest that there should be a closer relationship between the technical institutions and those who are responsible for the economic welfare of our country."

The president agreed with Lord Waverley that association members are responsible for a vast number of projects. Among those cited by Robertson were:

¶ The hydroelectric project at Kariba, in which a 400-ft-high and a 1900-ft-long dam is being constructed. Robertson added that the reservoir, when completed, will have "a storage capacity four and one-half times greater than the U.S.A. dam which is said to be the largest man-made dam in the world at the present time."

¶ The Bagdad sewers, costing an estimated £7 million.

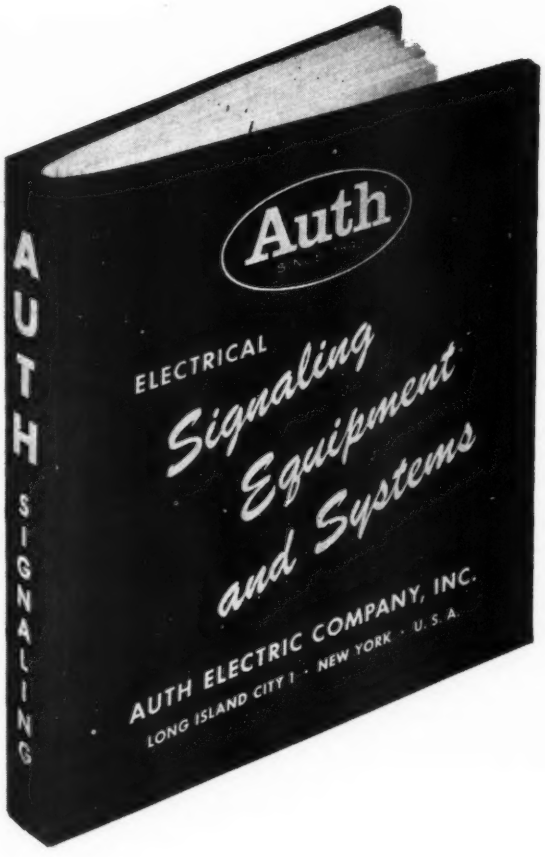
¶ The Wadi Thatthar Barrage, costing £9 million.

¶ The Gold Coast University College, valued at £6 million.

¶ Power stations in New Zealand, South Africa, South America.

¶ Large docks and harbor works in West Africa and New Zealand.

Robertson added that some Association members now are considering the design and construction of automated factories in Britain and abroad. The nuclear field, now getting into its stride, also will require further activity



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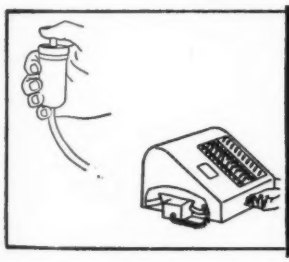

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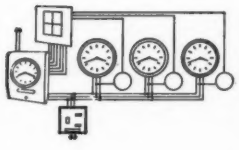

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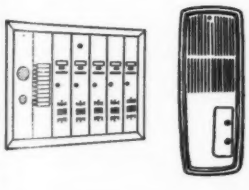

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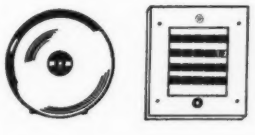

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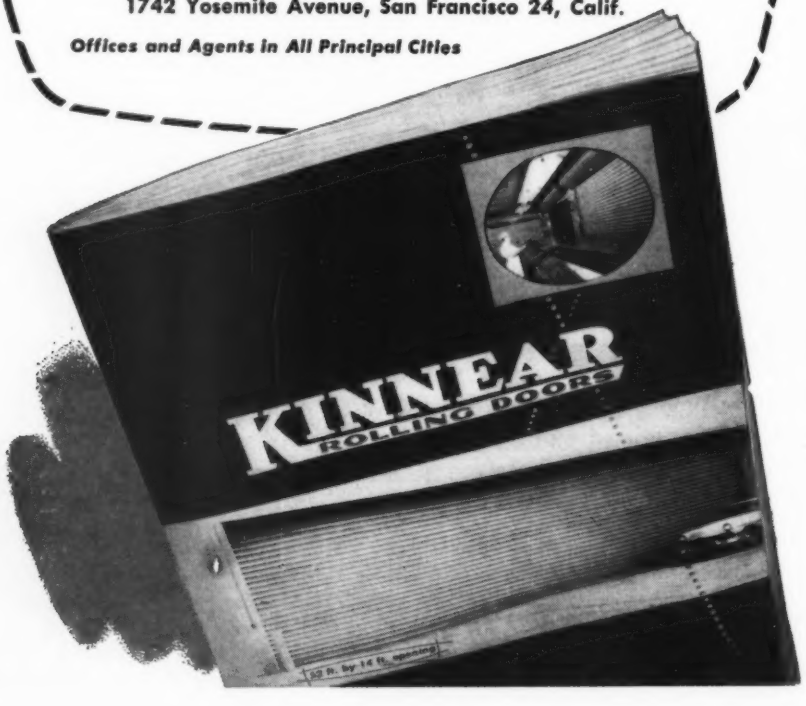

from British consultants, he concluded.

Lord Waverley stressed that while contractors and government groups normally have their own technical staffs, they constantly should keep in mind the advantages of employing outside consultants for large, specialized, or emergency projects.

The guest of honor also urged consultants to take an active part in nuclear developments, "where highly technical problems constantly are arising and where we want to concentrate the best talents in the profession."

Speaking of the engineering profession, Lord Waverley, who is an honorary member of the Institution of Civil Engineers, said, "I have a point to make which seems to me to be of some importance — that the term 'engineer' is sadly lacking in precision." The speaker explained that the term could indicate membership in a chartered institution on one hand or a trade union on the other.

After comparing the situation with that in other professions, Lord Waverley said he believes the solution is to be found in better organization, better publicity, more attention to the national aspect of engineering, and more stress on technical education — "promoting a better understanding on the part of young people and their parents of what engineering really is."

Lord Waverley pointed to the association of chartered institutions with a large number of scientific and technical institutions as an encouraging development. The two groups are associated under the Parliamentary Scientific Committee, which Lord Waverley headed for a number of years.

Mr. Julian Tritton, immediate past president of the Association and currently president of the International Federation of Consulting Engineers (FIDIC) proposed the toast to the guests. Derek Walker Smith, Minister of State, Board of Trade, responded.

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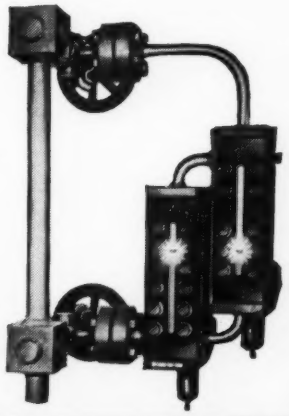

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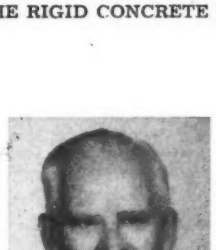
Designing Concret

THE ASSUMED NEUTRAL AXIS METHOD WAS USED IN DESIGNING THE RIGID CONCRETE FRAMES SUPPORTING THE TANKS.



CHARLES E. SHARP
Structural Engineer

A lively curiosity has led Mr. Sharp to take many personally conducted tours into the broad, fascinating realm of mathematics. Some of these excursions sprang from his desire to find simple solutions to engineering problems, such as the example recorded in this article. As engineer with the Austin Company, Cleveland District, 1950 through 1956, he found various opportunities to use this method of designing concrete sections. He was aided by the company's research staff in formulating the article.

The basic idea presented itself about 20 years ago when he developed the system in order to handle the design of complex bridge pier sections, carrying axial load and moment in two directions. This occurred in the office of Sverdrup and Parcel, Inc., consulting engineers of St. Louis, where he was designing piers and abutments for long span river bridges. Here, he also developed his "Seven-Place Natural Trigonometric Function Tables to Minutes with Increments to Seconds," pounding out the required multitude of figures in his spare time. These tables have been published and issued by the Marchant Calculating Machine Company since 1939.

Other engineering assignments include 7 years with the bridge department of the Missouri Pacific Railroad, and about 2 years apiece with the City of St. Louis on large sewer arch sections; with Westlake Construction Company on tall office buildings; with Horner and Shifrin, consulting engineers, on drainage problems and bridges; with Schmidt and Paolinelli, architects, on industrial buildings (all of St. Louis); and with The Wheeling and Lake Erie Railroad at Brewster, Ohio.

Born and educated in St. Louis, Mr. Sharp graduated from Washington University, in 1918, and spent 9 months in the Army. He is a registered engineer in Ohio, and now is employed by Cleveland Designers and Consultants, Inc.

Members by Assuming the Neutral Axis

FOR MANY YEARS, I have used a method for checking or designing reinforced concrete members as an alternate or supplement to the usual procedures. This method deals directly with the basic forces and areas as is done, for example, with plate girders. It is a cut and try scheme requiring successive calculations, each based on an assumed neutral axis position, until the desired results are obtained.

Recommended Applications

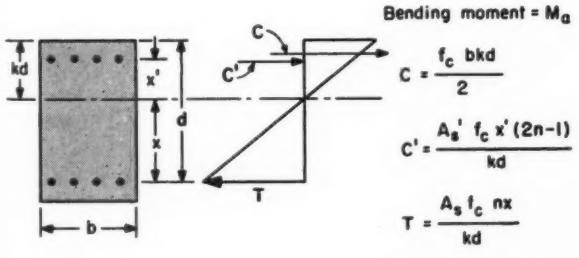
Designing engineers interested in this method no doubt will find that for a simple rectangular section with one line of tension bars the established formulas and tables are shorter. However, for special sections and for regular sections with more than one line of tension bars, this scheme is especially recommended, since formulas and tables are impractical for design problems of these types. Moreover, the method is an "open" one—the designer can see what is going on as his design progresses and can make adjustments along the way.

Details of the Method

Details of the method for a member in pure bending and also a member subjected to bending and direct stress are outlined in Table 1. In addition, Table 2 provides four selected examples covering: the rectangular section shown in Table 1 in pure bending, in bending and axial compression, and in bending and axial tension, and the illustrated special non-rectangular section in bending and axial compres-

Table 1—Details of the Method

Member in Pure Bending



In following calculation, drop the common term f_c. Assume value of kd.

$$C_1 = \frac{bkd}{2} \qquad = + \ldots . \bullet \frac{2kd}{3} \qquad = + \ldots . .$$

$$C_1' = \frac{A_s'x'\ (2n-1)}{kd} \qquad = + \ldots . \bullet x' \qquad = + \ldots . .$$

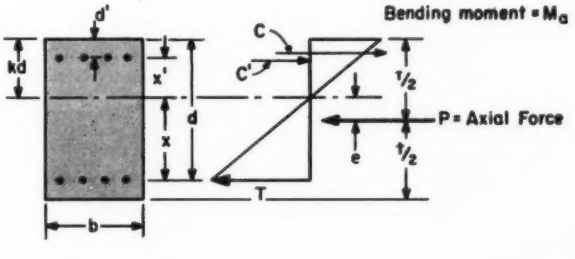
$$T_1 = \frac{A_s nx}{kd} \qquad = - \ldots . \bullet (-x) = + \ldots . .$$

$$\Sigma H = \overline{0} \qquad \Sigma M = \overline{+ \ldots . .}$$

If ΣH does not equal zero, try new kd value. When ΣH is approximately equal to zero,

$$f_c = \frac{12\ M_a}{\Sigma M}\ ;\ f_s = \frac{nf_c x}{kd}\ ;\ f_s' = \frac{(2n-1)\,f_c x'}{kd}$$

Member in Bending and Direct Stress



Assume value of kd.
Set C_1, C_1', and T_1 as before, for which the summations are ΣH and ΣM.

Then: Tentative value of $f_c = \frac{P}{\Sigma H}$

$$\text{Allowable moment} = (\Sigma M f_c \pm^{*} Pe) \div 12$$

If allowable moment does not equal M_a, try new kd. When allowable moment is approximately = to M_a,

$$f_c = \frac{P}{\Sigma H}\ ;\ f_s = \frac{nf_c x}{kd}\ ;\ f_s' = \frac{(2n-1)\,f_c x'}{kd}$$

*Use plus sign for a compressive force P and kd less than t/2 or for a tensile force P and kd more than t/2. Use the minus sign for vice versa.

Table 2—Selected Examples Showing Application of the Method

Pure Bending—Rectangular Section

$M = 100{,}000$; $d = 18''$; $b = 15''$; $d' = 2''$; $n = 10$

Trial $A_s = \dfrac{100{,}000 \times 12}{18 \times 17{,}500} = 3.8$; $A_s' = 1.5$

Try $kd = 3/8 \times 18 = 6.75''$

Process:

$C_1 = 15 \times 6.75 \div 2 = 50.6$

$C_1' = 1.5 \times 4.75 \times 19 \div 6.75 = 20.1$

$T_1 = 3.8 \times 10 \times 11.25 \div 6.75 = -64.0$

$\Sigma H = \overline{6.7}$ (not zero)

Assume new $kd = 6.5''$

$C_1 = 15 \times 6.5 \div 2 = 48.7 \times 2/3 \times 6.5 = 211$

$C_1' = 1.5 \times 4.5 \times 19 \div 6.5 = 19.7 \times 4.5 = 89$

$T_1 = 3.8 \times 10 \times 11.5 \div 6.5 = -67.5 \times (-11.5) = 776$

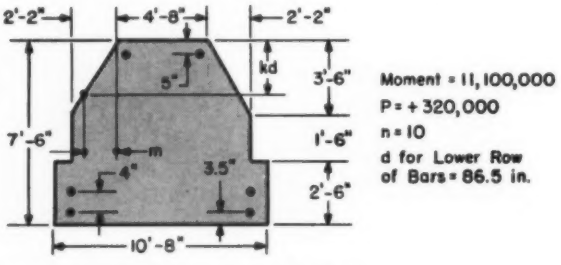
ΣH (close enough to zero) $= \overline{0.9}$ $\quad \Sigma M = \overline{1076}$

$f_c = 100{,}000 \times 12 \div 1076 = 1115$ psi

$f_s = 10 \times 1115 \times 11.5 \div 6.5 = 19{,}800$ psi

Note: Process for this example is longer than the usual one, but a designer may use it effectively when he can guess kd close enough to give rough values of f_c and f_s.

Bending and Axial Compression—Nonrectangular Section



Trial $A_s = \dfrac{11{,}100{,}000 \times 12}{85 \times 17{,}500} - \dfrac{320{,}000}{2 \times 20{,}000} = 82$ sq. in.

Try $A_s = 2$ rows of 29—#11 $= 45.3$ sq. in. per row

Try $A_s' = 1$ row of 8—#11 + 2—#6 $= 13.4$ sq. in.

Try $kd = 3/8 \times 85$ (average d) $= 32''$; $m = (26 \div 42)\,kd = 19.8''$

Process:

C_1 (rectangular part) $= 56 \times 32 \div 2 = 896$

C_1 (triang. part) $= 19.8 \times 2 \times 32 \div 6 = 211$

$C_1' = 13.4 \times 27 \times 19 \div 32 = 215$

$T_1' = 45.3 \times 10 \times 50.5 \div 32 = -715$

$T_1'' = 45.3 \times 10 \times 54.5 \div 32 = -772$

$\Sigma H = \overline{-165}$

Obviously, kd is too low

Try new $kd = 36''$; $m = 26 \div 42 \times 36 = 22.3''$

Process:

C_1 (rect.) $= 56 \times 36 \div 2 = 1008 \times 24 = 24200$

C_1 (triang.) $= 22.3 \times 2 \times 36 \div 6 = 267 \times 18 = 4800$

$C_1' = 13.4 \times 31 \times 16^* \div 36 = 185 \times 31 = 5700$

$T_1' = 45.3 \times 10 \times 46.5 \div 36 = -585 \times (-46.5) = 27200$

$T_1'' = 45.3 \times 10 \times 50.5 \div 36 = -635 \times (-50.5) = 32000$

$\Sigma H = \overline{240}$ $\quad \Sigma M = \overline{93900}$

Tentative $f_c = 320{,}000 \div 240 = 1330$ psi

Allowable moment $= \dfrac{1330 \times 93{,}900 + 320{,}000 \times 9}{12} = 10{,}650{,}000$

Actual f_c = about $1330 \times 11{,}100{,}000 \div 10{,}650{,}000 = 1385$ psi

$f_s = 1385 \times 10 \times$ say $50.7 \div 35.8 = 19{,}600$ psi

$f_s' = 1385 \times 16 \times 31 \div 36 = 19{,}000$ psi

*The value of 16 instead of $(2n - 1)$ or 19 was used for this calculation to hold f_s' below f_s. The results showing a slightly excessive value of f_c for 3000 psi concrete were deemed to be satisfactory because of the liberal design loading conditions.

Bending and Axial Compression—Rectangular Section

$M = 25{,}000$; $P = 20{,}000$; $t = 14''$; $d = 11.5''$; $b = 12''$;
$d' = 2''$; $n = 12$; $A_s' = 0.50$

Trial $A_s = \dfrac{25{,}000 \times 12}{11.5 \times 7/8 \times 20{,}000} - \dfrac{20{,}000}{2 \times 20{,}000}\left(\begin{matrix}\text{comp.}\\ \text{side only}\end{matrix}\right) = 1.00$

Try $kd = 3/8 \times 11.5 = 4.3''$

Process:

$C_1 = 12 \times 4.3 \div 2 = 25.8 \times 2/3 \times 4.3 = 74$

$C_1' = 0.50 \times 2.3 \times 23 \div 4.3 = 6.1 \times 2.3 = 14$

$T_1 = 1.00 \times 12 \times 7.2 \div 4.3 = -20.1 \times (-7.2) = 145$

$\Sigma H = \overline{11.8}$ $\quad \Sigma M = \overline{233}$

Tentative $f_c = 20{,}000 \div 11.8 = 1700$ psi

Allowable moment $= \dfrac{233 \times 1700 + 20{,}000\ (7 - 4.3)}{12} = 37{,}500$

Try new $kd = 4.8''$

Process:

$C_1 = 12 \times 4.8 \div 2 = 28.8 \times 2/3 \times 4.8 = 93$

$C_1' = 0.50 \times 2.8 \times 23 \div 4.8 = 6.7 \times 2.8 = 19$

$T_1 = 1.00 \times 12 \times 6.7 \div 4.8 = -16.8 \times (-6.7) = 113$

$\Sigma H = \overline{18.7}$ $\quad \Sigma M = \overline{225}$

Tentative $f_c = 20{,}000 \div 18.7 = 1070$ psi

Allowable moment $= \dfrac{225 \times 1070 + 20{,}000\ (7 - 4.8)}{12} = 23{,}700$

This is close enough to the actual moment.

Hence: $f_c = 1070 \times 25{,}000 \div 23{,}700 = 1130$ psi

$f_s = 1130 \times 12 \times$ (say $6.75 \div 4.75$) $= 19{,}200$ psi

Bending and Axial Tension—Rectangular Section

$M = 50{,}000$; $P = -10{,}000$; $t = 21''$; $d = 19''$;
$b = 12''$; $d' = 2''$; $n = 12$; $A_s' = 0.50$

Trial $A_s = \dfrac{50{,}000 \times 12}{19 \times 17{,}500} + \dfrac{10{,}000}{2 \times 20{,}000}\left(\begin{matrix}\text{tension}\\ \text{side only}\end{matrix}\right) = 2.05$

Try $kd = 3/8 \times 19 = 7.1''$

Process:

$C_1 = 12 \times 7.1 \div 2 = 42.6$

$C_1' = 0.50 \times 5.1 \times 23 \div 7.1 = 8.3$

$T_1 = 2.05 \times 12 \times 11.9 \div 7.1 = -41.0$

$\Sigma H = \overline{9.9}$

ΣH should be negative $(P = -10{,}000)$.

Try new $kd = 6''$

Process:

$C_1 = 12 \times 6 \div 2 = 36.0 \times 2/3 \times 6 = 144$

$C_1' = 0.50 \times 4 \times 23 \div 6 = 7.7 \times 4 = 31$

$T_1 = 2.05 \times 12 \times 13 \div 6 = -53.2 \times (-13) = 690$

$\Sigma H = \overline{-9.5}$ $\quad \Sigma M = \overline{865}$

Tentative $f_c = -10{,}000 \div (-9.5) = 1050$ psi

Allowable moment $= \dfrac{865 \times 1050 - 10{,}000\ (10.5 - 6)}{12} = 71{,}000$

Try new $kd = 5.8''$

Process:

$C_1 = 12 \times 5.8 \div 2 = 34.8 \times 2/3 \times 5.8 = 135$

$C_1' = 0.50 \times 3.8 \times 23 \div 5.8 = 7.5 \times 3.8 = 29$

$T_1 = 2.05 \times 12 \times 13.2 \div 5.8 = -56.2 \times (-13.2) = 741$

$\Sigma H = \overline{-13.9}$ $\quad \Sigma M = \overline{905}$

Tentative $f_c = -10{,}000 \div (-13.9) = 720$ psi

Allowable moment $= \dfrac{720 \times 905 - 10{,}000\ (10.5 - 5.8)}{12} = 50{,}400$

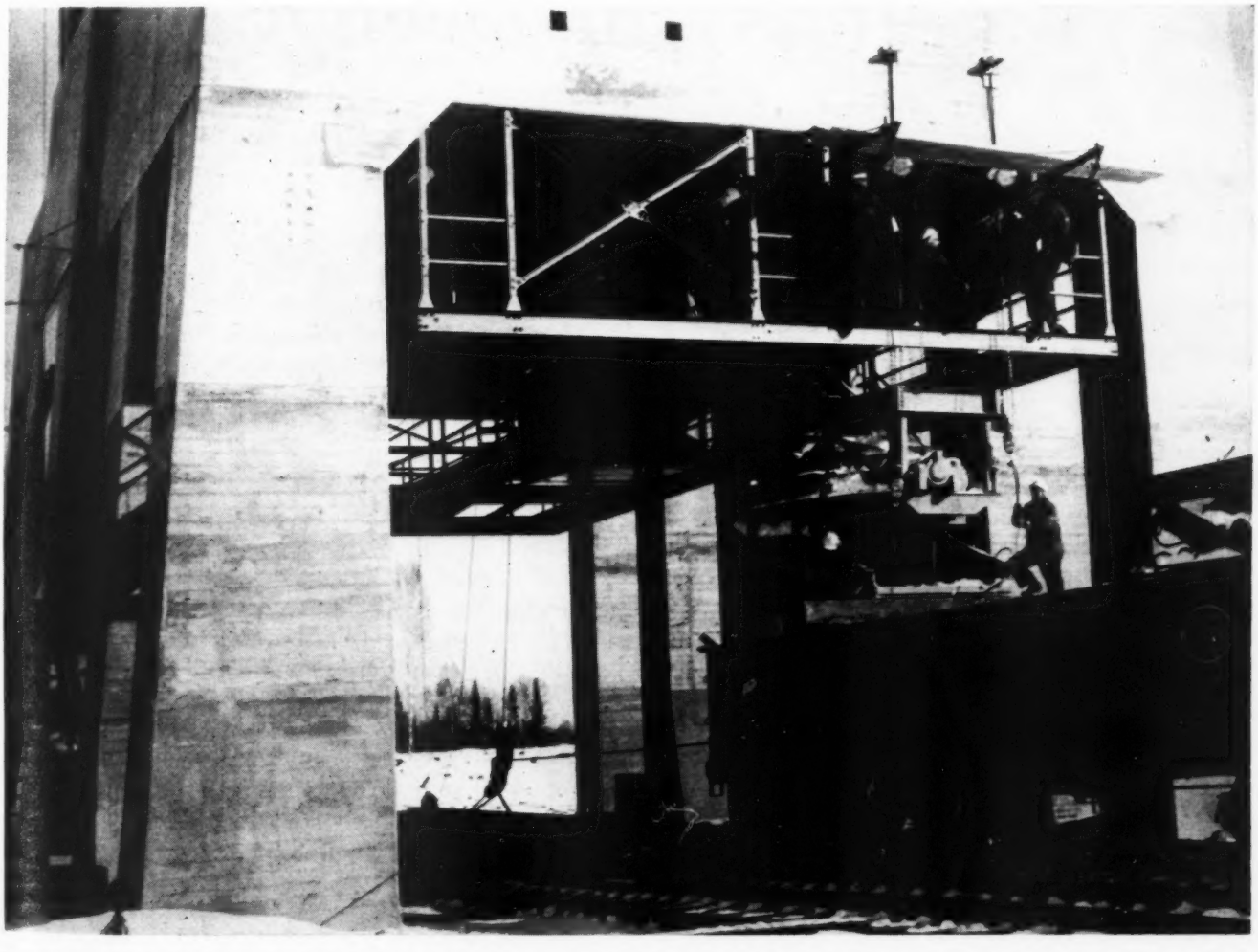
Hence f_c = about 715 psi

$f_s = 715 \times 12 \times 13.2 \div 5.8 = 19{,}500$ psi

sion. These data are based on the values defined in the following list of nomenclature:

b = width of section, in inches
t = depth of section, in inches
d = depth from compression face of section to center of reinforcing steel in tension, in inches.
d' = depth from compression face of section to center of reinforcing steel in compression, in inches
kd = depth from compression face of section to neutral axis, in inches
x = distance from neutral axis to center of reinforcing steel in tension, in inches
x' = distance from neutral axis to center of reinforcing steel in compression, in inches
e = eccentricity of axial force measured from gravity axis, in inches
A_s = effective cross-sectional area of reinforcing steel in tension, in square inches
A_s' = effective cross-sectional area of reinforcing steel in compression, in square inches
C_1 = total compressive stress in concrete, in pounds
C_1' = total compressive stress in reinforcing steel, in pounds
T_1 = total tensile stress, in pounds
f_c = allowable unit compressive stress of concrete, in pounds per square inch
f_s = tensile unit stress in reinforcing steel, in pounds per square inch
f_s' = compressive unit stress in reinforcing steel, in pounds per square inch
n = ratio of unit stress of steel to unit stress of concrete
P = axial force, in pounds
M_a = bending moment, in foot-pounds
ΣH = summation of individual areas, in square inches
ΣM = summation of their moments about the assumed neutral axis, in cubic inches

The nonrectangular section analyzed in Table 2 was taken through one of the six, large, reinforced concrete frames shown in the photographs and designed by the writer while serving as engineer in the Austin Company's Cleveland office. These frames have 32-ft clear spans over two railroad tracks, and they support two, 100-ft high reinforced concrete storage tanks which are 25 feet above track level. The tanks, together with their contents, have an aggregate weight of 5000 tons — a substantial loading of the concrete frames. ▲▲



THESE FRAMES HAVE 32-FT CLEAR SPANS OVER RAILROAD TRACKS AND SUPPORT TWO CONCRETE STORAGE TANKS.

Ellicott Machine

SMALL PORTABLE DREDGE DESIGNED FOR USE IN NARROW WATERWAYS. DREDGED MATERIAL IS DEPOSITED ON BANK.

New Ideas in Dredging

CARL H. GIROUX, Special Assistant
Department of the Army, Office of the Chief of Engineers

WITHIN THE PAST FEW YEARS there have been built a number of hydraulic dredges, both of the pipeline type and the sea-going hopper type, that far exceed in capacity any formerly used. On the other hand, during this same period dredges have been developed of extremely small size and capacity. Because of their portability and low cost, these small dredges have stimulated the interest of those concerned with relatively small jobs, which formerly had to be attacked by more expensive means. Now that it is possible to procure dredges that can be shipped overland by rail or truck, either as integral units or in sections easily assembled at the site, the scope of hydraulic dredging has greatly increased.

CE exclusive

Portable Dredges

One of the best examples of a small portable dredge is illustrated. It was designed for use in narrow waterways such as irrigation and drainage canals where the dredged material is to be deposited along the adjacent banks. Here the customary floating and shore pipeline is eliminated, and the material is pumped ashore through a suspended discharge pipe long enough to deposit the material on either side of the canal. This dredge is very versatile and is completely self-contained. Forward and after spuds hold the dredge stationary in the dredging position and the cutter ladder swings about a pivot by means of a double acting hydraulic piston. Forward and lateral movements are accomplished by walking spuds. Power is furnished by a single diesel engine, and one man can control all dredging operations. This dredge can be transported on a flat car or low-bed trailer.

Portability, however, is not confined solely to small dredges. The *"Western Chief,"*[1] recently built for the Western Contracting Corporation, is a 30-in. cutter type dredge, having a total of 10,950 installed horsepower. It is one of the most powerful dredges with a self-contained power plant. The pump is driven through reduction gears by four, 1500-hp electric motors, and the cutter is driven by a 1500-hp electric motor mounted on the ladder. Power is derived from six, 1600-hp and three, 450-hp diesel engines. The hull was built in sections of such size and weight that they could be transported overland and assembled at the site of the work. The

use of electric drive for the dredge pump greatly facilitated the sectionalization of the hull and provided maximum flexibility and economy in handling a large variety of materials through varying lengths of pipeline.

The initial project for this dredge was on the Missouri River, where it was employed in making the closure at the Fort Randall Dam.[2,3] This was the first instance in which a dredge was used for dam closure, but the results were highly satisfactory. The operation was possible only because the dredge could be assembled at the site and because a material susceptible to dredging (soft rock) was locally available.

Recently a number of 12-in. diesel dredges of the portable type were built for foreign service. Here the problem was one of initial delivery. The cost and risk of towing vessels of this size on long ocean voyages is almost prohibitive. Therefore, these dredges were built in sections readily shipped by rail and cargo vessel. They were completely assembled and tested at the builder's plant, all machinery was installed, and piping and wiring put in place and tested. Then, the parts were match-marked, and disassembled for shipment.

Electric Dredges

Where it is possible to purchase electric power at low cost, and where a dredge is to be used for a long period of time in one locality, it is frequently economical to omit the prime movers from the dredge and drive the machinery by electric motors. Transmission can be through overhead lines or portable submarine cable.

The *Hydro-Quebec* is an electric powered hydraulic pipeline dredge built for the Beauharnois Light, Heat & Power Company for use in the intake channel of the Beauharnois hydroelectric power plant on the St. Lawrence River. When this power plant was expanded, the original headrace channel became inadequate, and it was necessary to deepen and widen it.

The majority of the material in this channel is a cemented boulder clay which, on account of its plasticity, cannot be broken up by explosives but must be excavated in its natural state. Prior to the completion of the *Hydro-Quebec,* this work was done by a combination of a dipper dredge and a washing and crushing plant known as the *Manseau-Growler.* The dipper dredge was moored along side the *Growler* and deposited the excavated material on an apron from which it was carried aft on a chain link conveyor. During its travel, it was washed by two high pressure hydraulic monitors to separate the clay from the boulders. The mixture of clay and water flowed directly to a sump tank located in the hull. The boulders passed through a crusher where they were reduced in size. This crushed rock was then also deposited into the sump tank. A specially designed centrifugal dredge pump removed the entire mixture from the tank and deposited it ashore through a floating pipeline. This procedure, while successful, was slow and costly.

Dredging Costs

Now, the *Hydro-Quebec* is capable of dredging about 60 percent of the material in the channel, the other 40 percent, because of the size of the boulders, being done by the *Manseau-Growler* which has been continued in service for this purpose. In 1955 the *Hydro-Quebec* dredged approximately 2,870,000 cubic yards at 61 cents per cubic yard compared with 575,000 cubic yards for the *Manseau-Growler,* at a cost of $2 per cubic yard. However, in fairness to the *Manseau-Growler,* the record shows that the *Hydro-Quebec* has a corresponding material out-

Beauharnois Light, Heat & Power

THE "HYDRO-QUEBEC," AN ELECTRIC POWERED HYDRAULIC PIPELINE DREDGE ON THE ST. LAWRENCE.

Ellicott Machine

HERE ARE SOME BOULDERS PUMPED BY THE "HYDRO-QUEBEC." SHE HANDLES ROCK 2 FEET IN DIAMETER.

Ellicott Machine

STURDILY BUILT CUTTER OF THE "HYDRO-QUEBEC" HAS REMOVABLE TEETH OF HIGH-STRENGTH STEEL.

Ellicott Machine

ICE FORMATION IN THE CUTTER OF THE DREDGE "RANDALL," AT STEEP ROCK LAKE, ONTARIO, CANADA.

put of approximately three times that of the *Growler* at 46 percent of the cost.

The *Hydro-Quebec* has a pump with 36-in. diameter discharge, driven by an 8000-hp wound rotor induction motor. It is capable of handling boulders up to 24 inches in diameter.

Heavy impact loads are transmitted to the ladder assembly by the material encountered, and therefore these parts are required to be of particularly sturdy construction. The photograph of the cutter illustrates this point. It is equipped with removable teeth made of high-strength alloy steel.

Steep Rock Lake Projects

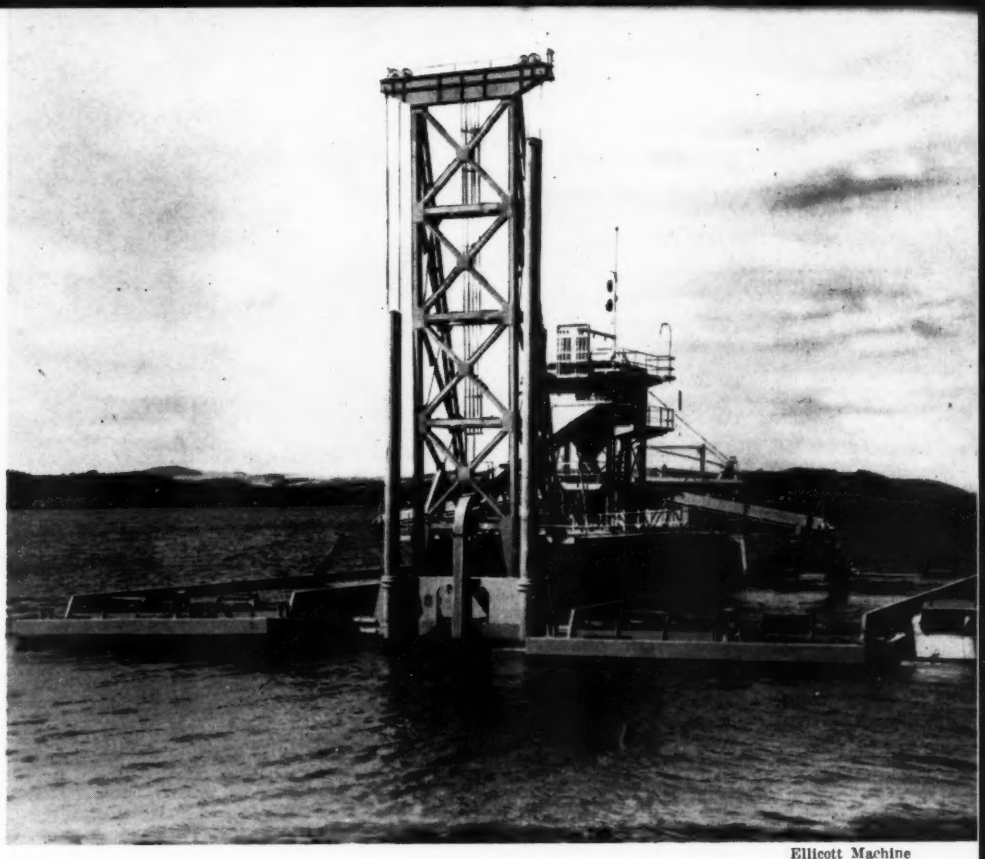
Other excellent examples of the use of electrically driven dredges are those employed by the Caland Ore Company Limited (a subsidiary of Inland Steel Company) at Steep Rock Lake, Ontario, Canada.

With rapid depletion of iron ore deposits in the Mesabi Iron Range in northern Minnesota, and with the increased demand for steel, it has been found necessary to explore other sources of supply. One of the largest high grade ore bodies on the North American continent is located in the vicinity of Atikoken, Ontario, and a few years ago initial development was undertaken by the Steep Rock Iron Mines, Ltd.[4] Whereas the Mesabi deposits occur in horizontal veins, those at Steep Rock have been tipped to an acute angle and are largely covered by a chain of rather deep lakes. Strip-mining, as employed at Mesabi, cannot be used to any great extent at Steep Rock, and the ore veins must be mined by underground methods.

The sides and bottoms of the lakes are covered by fine silt deposits. It has been found that if these deposits are not removed, the silt enters the ore seams when mining operations are undertaken and dilutes the quality of the ore. In order to overcome this difficulty, the Steep Rock Iron Mines, Ltd., proceeded to remove the silt deposits in the middle

Ellicott Machine

THIS COMBINATION DUSTPAN AND CUTTER-HEAD DREDGE WILL SOON WORK THE MAGDELENA RIVER IN COLUMBIA, S. A.



THIS DREDGE RECOVERS WASTE CARRIED DOWN THE SUSQUEHANNA RIVER FROM THE ANTHRACITE MINES UPSTREAM. HOLTWOOD STEAM PLANT BURNS THIS COAL.

Ellicott Machine

arm of Steep Rock Lake by hydraulic dredging. The dredges worked around the periphery of the lake, gradually lowering the elevation of the water and exposing the silt deposits along the shore so that they were accessible. After that high pressure hydraulic monitors were used to wash down the slopes as the water was lowered so that they were finally left free of silt. Dredging was continued until the lake was entirely dry and all silt removed. This operation was so successful that when the Caland Ore Company decided to develop an ore body underlying the east arm of Steep Rock Lake, similar procedure was adopted.

Details of the Dredges

Because of the large amount of material to be removed (estimated at over 160,000,000 cubic yards) and the short time available for doing the work, dredges far greater in capacity than those used by the Steep Rock Iron Mines, Ltd., were indicated, and inasmuch as no existing plant having suitable characteristics was available, the Caland Ore Company decided to purchase new equipment especially designed for this project. The dredges *Clarence P. Randall* and *Joseph L. Block* and associated dredging equipment were built and went into operation in the spring of 1955. The hulls were prefabricated at a shipyard in Port Arthur. The hull sections and machinery were shipped by rail and truck to the site, and the dredges were assembled on the shore of the lake.

A contract was consumated with Construction Aggregates Corporation, the same firm engaged on the previous project, to design, construct and operate the dredging plant. In order to complete the work within the allotted time, it was found necessary to employ two complete dredging units, each unit made up of a 36-in. dredge, a floating booster, and a shore booster. The pumps, one on the dredge and one on each booster, are driven by 10,000-hp wound rotor induction motors, totaling 30,000-hp for each of the two dredging units. In this instance, the material to be dredged is soft and the same problems were not encountered as at Beauharnois. Therefore the cutters on the dredges are powered by 1000-hp wound rotor induction motors, and a totally different type of cutter is employed.

The scheme of operation is the same as that used on the middle arm of Steep Rock Lake but the distance to the spoil area and the maximum lift are much greater, which, together with the increased capacity, accounts for the tremendous power required for pumping. When the bottom of the lake is reached, the total lift will be approximately 700 feet, and the pipeline length may at times be as much as 30,000 feet.

In order to utilize the plant and operating personnel to the best advantage, operation is continued throughout the year, even though in the latitude of Steep Rock Lake the winters are very severe and temperatures frequently drop as low as –40 F and have been known to reach –60 F. Under these conditions, the ice must be broken in the dredging area, this being done by work boats fitted with ice breaking bows. Freezing of the pipeline during shutdown must be guarded against, and this is done by provid-

Corps of Engineers

"ESSAYONS" WAS BUILT BY THE CORPS OF ENGINEERS TO DREDGE THE 45-FT CHANNELS INTO NEW YORK.

ing means for prompt draining if stoppage occurs. Special materials are used in the construction of the floating pipeline, for ordinary steel tends to become brittle at extremely low temperatures.

In planning the work it was expected that each dredging unit would remove an average of approximately 1,500,000 cubic yards per month, which would enable the project to be completed in 4½ years. While the highest monthly production for the two units has been 4,600,000 cubic yards, the total yardage dredged to date is somewhat below the target figure. Inasmuch as this period includes breaking-in time and, in the particular areas where the dredges have been operating, unforeseen sand and gravel deposits were encountered, it is expected that future production will bring the total yardage up to schedule.

Special Purpose Dredges

A self-propelled dustpan type of dredge has been developed by the Corps of Engineers for removing sand bars on the Missouri and Lower Mississippi Rivers. These sand bars form very fast after the recession of a high water stage of the river and must be removed quickly so as not to interfere with water-borne traffic. The dustpan dredge moves under its own power to the site of the work, places port and starboard anchors, and drops downstream of the bar to be removed. Instead of a cutter, as used on an ordinary hydraulic dredge, a wide suction head resembling a huge dustpan is provided at the bow. High pressure water jets are used for agitation. By means of winches, assisted by the propelling machinery to keep proper alignment, the dredge is pulled ahead into the bar. Sand and silt is sucked up by a dredging pump and is discharged through a rigid floating pipeline which is free to swing in an arc of 180 degrees or more about a pivoted elbow at the stern of the dredge. At the far end of the pipeline the discharge stream impinges on a baffle plate. By varying the angle of this baffle plate, it is possible to swing the pipeline at will, even against the river current. By this means, the material is deposited at some distance from the channel, where it either stays until the next high water or is carried away immediately by the river current.

On the Magdelena River in the Republic of Columbia, South America, conditions similar to those on the Missouri and Mississippi rivers exist in the upper navigable reaches. To date very little or no dredging has been done in this part of the river and no defined channel exists. Such towboats and packet boats as ply the river must continually seek the deepest water purely by observation of the pilots. At low stages of the river, navigation is very hazardous, and boats frequently go aground. Navigation at night is impossible for the unstable channel cannot be marked by ranges as on our inland rivers. Under these conditions, boat transportation is limited and is far more expensive than if well-developed channels of proper depth were available.

Combination Cutter and Dustpan Dredge

Recently a semi-public corporation, Adanavi, which operates a number of vessels on the Magdelena River, decided to initiate a dredging program. The dustpan type of dredge was selected as being most suitable, and one has been constructed but not yet placed in service.[5] Complete investigation of the river bottom had not been made, and it was feared that in some places the deposits might be too hard to dredge with a suction head. Therefore, a combination cutter and dustpan dredge has been built — an innovation in this field. The ladder and hoisting gear have been so designed that the suction head can be replaced with a cutter section without dry-docking the vessel. The dredge will be so versatile that it can remove almost any kind of material from the channel.

This dredge is of the tunnel type with twin screws driven by two, 500-hp direct current motors. Power for propelling and dredging is furnished by means of a single diesel engine which drives two generators and is connected to the dredge pump through a reduction gear and clutch. When the dredge is moving from place to place, the clutch is disengaged and the full engine power is available for propulsion. When dredging, most of the engine capacity is used for driving the pump but a small amount is available for driving the propelling motors when needed.

The speed and direction of rotation of the two propelling motors are controlled independently by a variable voltage system. In order to avoid overloading the engine when navigating in extremely shallow water and still be able to obtain full horsepower in more favorable waters, automatic regulation of the maximum power is provided.

The draft of the vessel is only 4-feet 6-inches, which will enable it to traverse most of the river even during extreme low water stages.

Another example of special purpose dredges is a 14-in. hydraulic cutter type dredge constructed for

the Pennsylvania Power & Light Company to reclaim coal deposited by the Susquehanna River in the reservoir of the Safe Harbor hydroelectric plant. Over a long period of time, the Susquehanna River has been carrying waste from the anthracite mines on its headwaters into the lower reaches where, due to lowering of the water velocity, it has been deposited in large quantities in the river bed. For many years these deposits have been worked in a small way by commercial operators whose dredges may be seen during the low water season in the riffles in the vicinity of Harrisburg, Pa.

Modern Plants for Reclaiming River Coal

As early as 1925 the Pennsylvania Water & Power Company put into operation at Holtwood, Pa., a 30,000-kw steam power plant designed especially to burn this "river coal." The equipment used in processing the coal from the Holtwood reservoir was wasteful, and the power company eventually built its own reclaiming plant. The results obtained by this plant were so satisfactory that in 1951 the company decided to enlarge its steam station and to establish a modern reclaiming plant capable of reclaiming about 570,000 tons of coal annually from the Safe Harbor reservoir.[6] This has been in operation since 1953 with excellent results.

One of the essential elements of this reclaiming plant is a modern hydraulic dredge of the cutter type.[7] which performs the initial operation of removing the coal-bearing deposit from the bottom of the reservoir and placing it into hopper barges for transportation ashore. This dredge is provided with a self-contained screening plant for removing trash and means for discharging the remainder into barges. Barges are moored one on each side so that they can be filled alternately. Specially designed winches are used for moving the barges fore and aft so that they can be uniformly loaded.

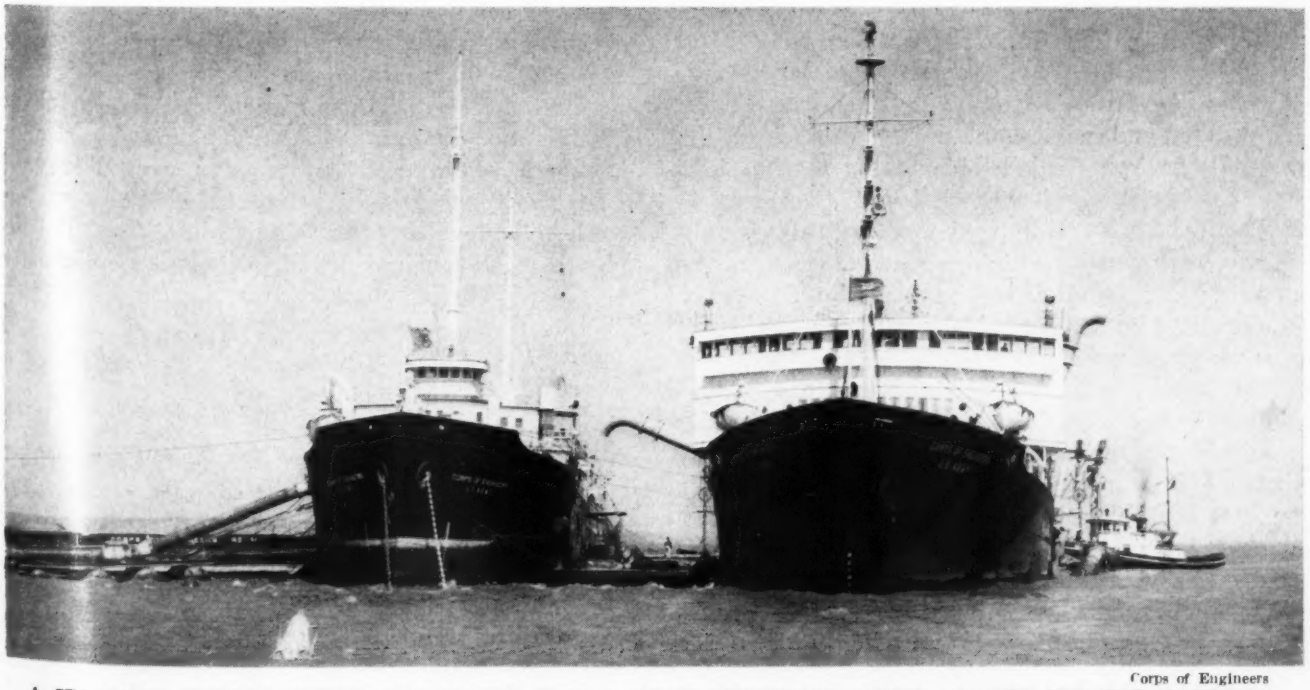
The dredge pump is driven by a 350-hp diesel engine, and 440-v alternating current power for auxiliaries is supplied by a 250-kva diesel generating set.

Sea-Going Hopper Dredges

For over 100 years, the Corps of Engineers has been utilizing sea-going hopper dredges for improving navigable channels in the harbors of the United States where weather conditions, congested traffic, and lack of disposal areas make the use of other types of dredges impracticable. In this type of dredge, the vessel proceeds under its own power over the dredging ground. It removes the material by suction and discharges it into self-contained hoppers. When the hoppers are filled, the dredge proceeds to a place at sea where the material can be properly disposed of, opens doors in the bottoms of the hoppers, and discharges the load. Where conditions are suitable, this operation is very effective and economical.

Many improvements and refinements have been made in sea-going hopper dredges, and today they are among the most modern of sea-going vessels. As the scope of channel improvements has enlarged and channels have been deepened and widened, the average distance to suitable dumping grounds has increased with the result that the tendency has been to go to dredges of large capacity and higher running speeds.

In New York harbor, the principal ship channels



Corps of Engineers

A SEA-GOING HOPPER DREDGE DISCHARGES INTO A SUMP REHANDLER WHICH CARRIES OFF THE MATERIAL.

are now required to be 45 feet or more in depth. It has required a tremendous amount of dredging to reach and maintain this depth. As a consequence, in 1949, the *Essayons*[8] was built to cope with this situation. It is a vessel 525 feet in length and with a hopper capacity of 8000 cubic yards — far greater than any other dredge of this type in existence. It has twin screws, each driven by a 4000-hp direct current motor, and two dredging pumps of 1850-hp each. Power for this equipment is supplied by two identical steam turbines, each driving a propulsion generator, a dredge pump generator, and an auxiliary generator. Variable voltage control is used for the propelling and dredge pump generators.

This ship is capable of attaining a speed of 15 knots when traveling to and from the dumping ground and this, combined with its large hopper capacity, has enabled it to work very effectively under adverse conditions.

Design Trends

The *Essayons* is equipped with many features not found in earlier dredges. For instance, an ingenious scheme for lifting the drag pipes free of the water and stowing them on deck when not in use has been installed. This leaves the sides of the dredge free of obstructions which facilitates docking, and by reducing friction results in a higher running speed. Modern navigational aids such as a gyro-compass, radio direction finder, fathom meter, ship to shore radio-telephone, and radar are provided. Complete pilot house and wing bridge controls are installed for the propelling motors. These devices make it possible for the dredge to continue safely in operation under very bad weather conditions. It also is equipped with instruments such as a drag-depth indicator and yardage meter, which facilitate dredging operations. The quarters are commodious and are air-conditioned, and include recreational facilities for the officers and crew.

Dredging and maintaining a channel in the Delaware River from Philadelphia to the sea has long imposed many problems not found elsewhere in the United States. This portion of the river is subject to tidal action, and silt brought down from the main stem of the river and by the Schuylkill River is deposited in considerable quantities when it reaches slack water.

The number of ships using the waterway precludes the use of pipeline dredges, which normally would be the most efficient for this work, and the distance from suitable deep water disposal areas imposes a problem for hopper dredges. In the past, the best known solution was to excavate rehandling basins along the shore from which material dumped by hopper dredges was pumped by pipeline dredges to remote disposal areas. This system worked very well but was rather costly because an appreciable portion of the material dumped by the hopper dredges found its way back into the channel. This material is mostly fine silt which, after being disturbed, settles very slowly, and much of it remains suspended in the water after being dumped in the rehandling basins.

"Sump Rehandlers"

Recently a plant known as a "sump rehandler" has been tried as a replacement for the rehandling basin and pipeline dredge.[9] The hopper dredge *New Orleans,* which had become obsolete, was taken out of service, its old machinery removed, and new pumping machinery installed. The new machinery included diesel generating sets and four, 1500-hp electric motors driving two, 28-in. centrifugal pumps connected in series and capable of producing a discharge pressure of over 200 psi. The suction of the first pump is connected to a manifold into which material flows from the hoppers. The discharge from the second pump is connected to a shore pipeline leading to the nearest disposal area, which may be several thousand feet from the river. The sump rehandler is moored firmly in position but may be moved to another location when necessary.

Hopper dredges used in this type of operation come along side the sump rehandler, are secured, lower a discharge pipe, and pump their loads directly into the sump rehandler. When the hoppers are empty, the dredge returns to the dredging area. In this particular instance, two hopper dredges, the *Goethals* with 5000-cubic yards capacity and the *Comber* with 3000-cubic yards capacity, have been modified for the operation. These modifications consist essentially of manifolds for collecting material from the hoppers, and piping through which the material can be discharged into the sump rehandler by means of a pivoted spout.

During the first year in which the sump rehandler was used on the Delaware River, over 15-million cubic yards of solids were handled. This is about double the former yearly production for similar dredging equipment, and the cost per cubic yard was about one-half. It is expected that this system will be adopted in other places where fine silt is to be removed by hopper dredges and where distances to deep water disposal areas are great. ▲▲

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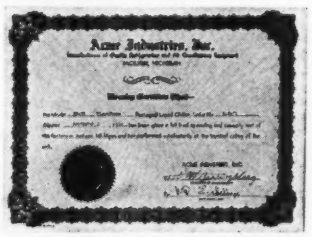

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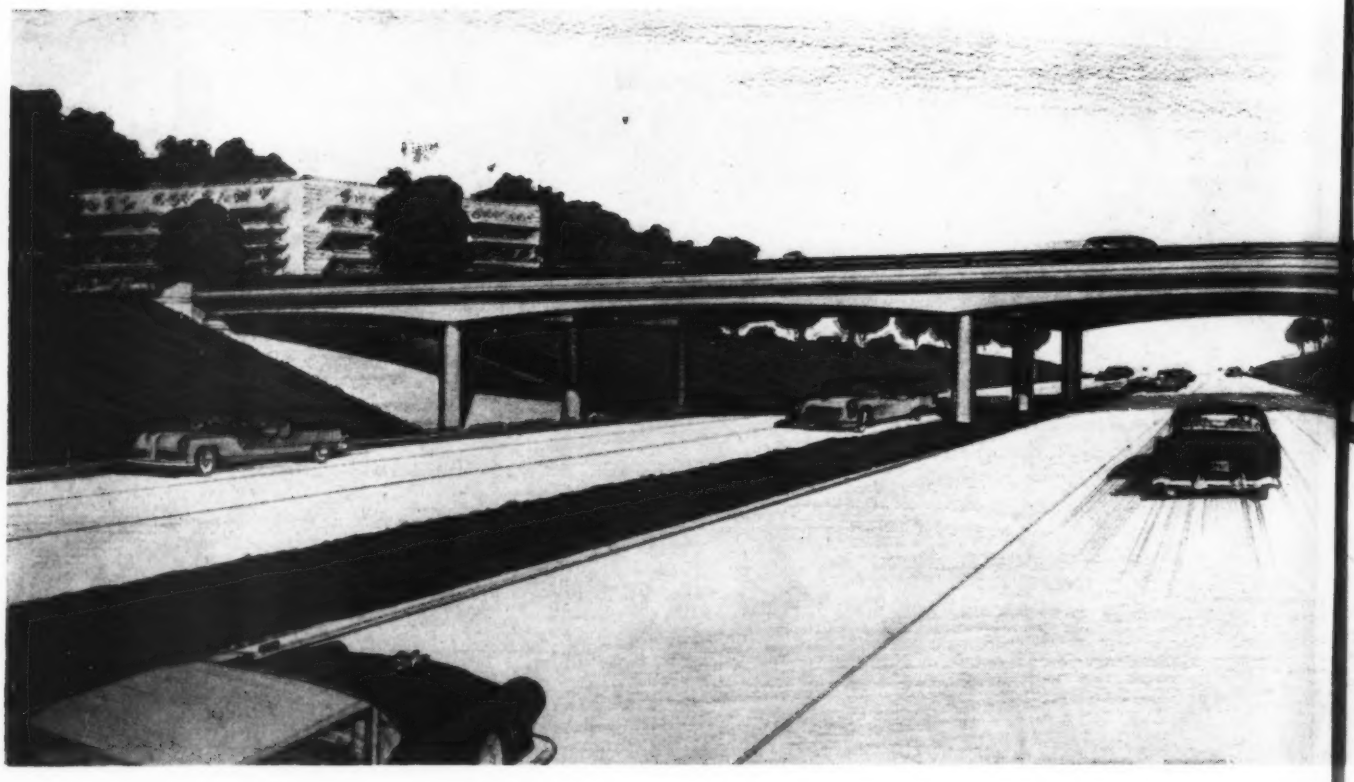

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R. N. Bergendoff, partner in the firm of Howard, Needles, Tammen & Bergendoff, of Kansas City, Mo., is a civil engineering graduate of the University of Pennsylvania, Class of 1921. He joined the firm of Ash, Howard, Needles & Tammen, in 1928, after several years experience as a draftsman and designer with state highway departments. He became a member of the firm in 1940. Bergendoff's primary engineering experience has been in the fields of bridge and highway design. He has been associated with projects in 40 states including turnpikes in 13 states and expressways in 20 of the major cities in the United States. This year he is president of the Kansas City, Mo., Rotary Club. He is a member of the American Society of Civil Engineers, the Missouri Society of Professional Engineers, the American Concrete Institute, and the Institute of Construction Engineers.

AMERICA is a nation on wheels. In 1956, 61-million vehicles operated over our roads as compared to 30 million in 1945. Our automobile industry turns out some 8-million new vehicles each year. Authorities predict that by 1975 we may expect to have 100-million vehicles, with vehicular miles of travel approaching twice that on our highways and streets of today.

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These vehicles operate over a street and roadway pattern designed for the horse and buggy era. Our primary highway system differs little from that which existed when the country had only 20-million motor vehicles traveling at average speeds of about one-half of the present rate. Of the 3-million miles of highway, only some 750,000 miles are paved. Thirty percent of the Federal Aid Highway System in operation today was built prior to 1930 — to now obsolete design standards. Increase of truck widths to eight feet and passenger car widths to seven feet have forced a change of the original nine-ft highway lane to a current minimum standard of 12 feet. Average driving speeds of passenger cars have increased from 37 mph in 1942 to 52 mph in 1956.

American motorists agree that a far reaching program of highway improvements is mandatory. Plans must consider not only the handling of the heavy

ays of Tomorrow

and increasing traffic, but also the reduction of enormous property damage and loss of life through accidents. It is estimated that adequate highways would reduce the operating cost on the composite motor vehicle one cent a mile which, applied to the current vehicle miles of travel, would effect a saving of $6 billion per year.

Effect on Economy

The increase in motor vehicle transportation has had far reaching effects on our economic development. One of every six business enterprises depends upon the motor car. One-sixth of all taxes come from the motor vehicle and highway transportation. One of every seven jobs in the United States is in the motor vehicle transportation field.

During World War II the seriousness of the obsolescence of our present system was recognized by the Federal authorities. The problems of evacuation of urban areas under bombing attacks and the provision of adequate avenues of access to defense areas were studied seriously. A coordinated plan for a system of important highways was formulated by the Bureau of Public Roads working in cooperation with the state highway departments. Originally designated as a military system of highways, it became known after World War II as the Interregional Highway System. The 84th Congress, by the Federal Aid Highway Act of 1956, has officially designated the program as a National System of Interstate and Defense Highways.

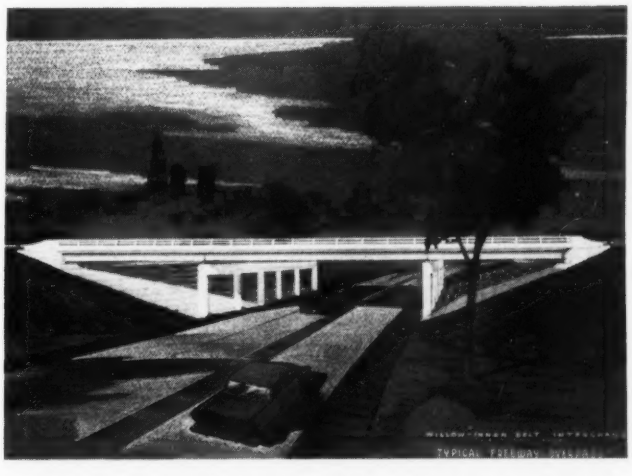
Too Little Money

Prior to the passage of the Act of 1956, efforts toward financing of this highway system offered little hope for real progress. The rate of financing available prior to 1956 would have required 100 years to complete the Interstate System to meet traffic requirements of 1975. The National System of Interstate and Defense Highways was laid out to connect certain control points. It passes through all of the 48 states, connects 90 percent of all cities of 50,000 population or over, and ties together 42 of the state capitals. The mileage involved in these connecting routes totals 37,700 miles. An additional 2300 miles were added to provide for urban circumferentials, radials, bypasses, and urban connections. An additional 1000 miles, not yet designated, was provided for in the Act. At present, comparable routes of this system carry 20 percent of all rural traffic and 10 percent of all urban traffic. It is estimated that this 41,000-mile system, representing only 1¼ percent of the National Highway System, will carry 25 percent of all highway traffic.

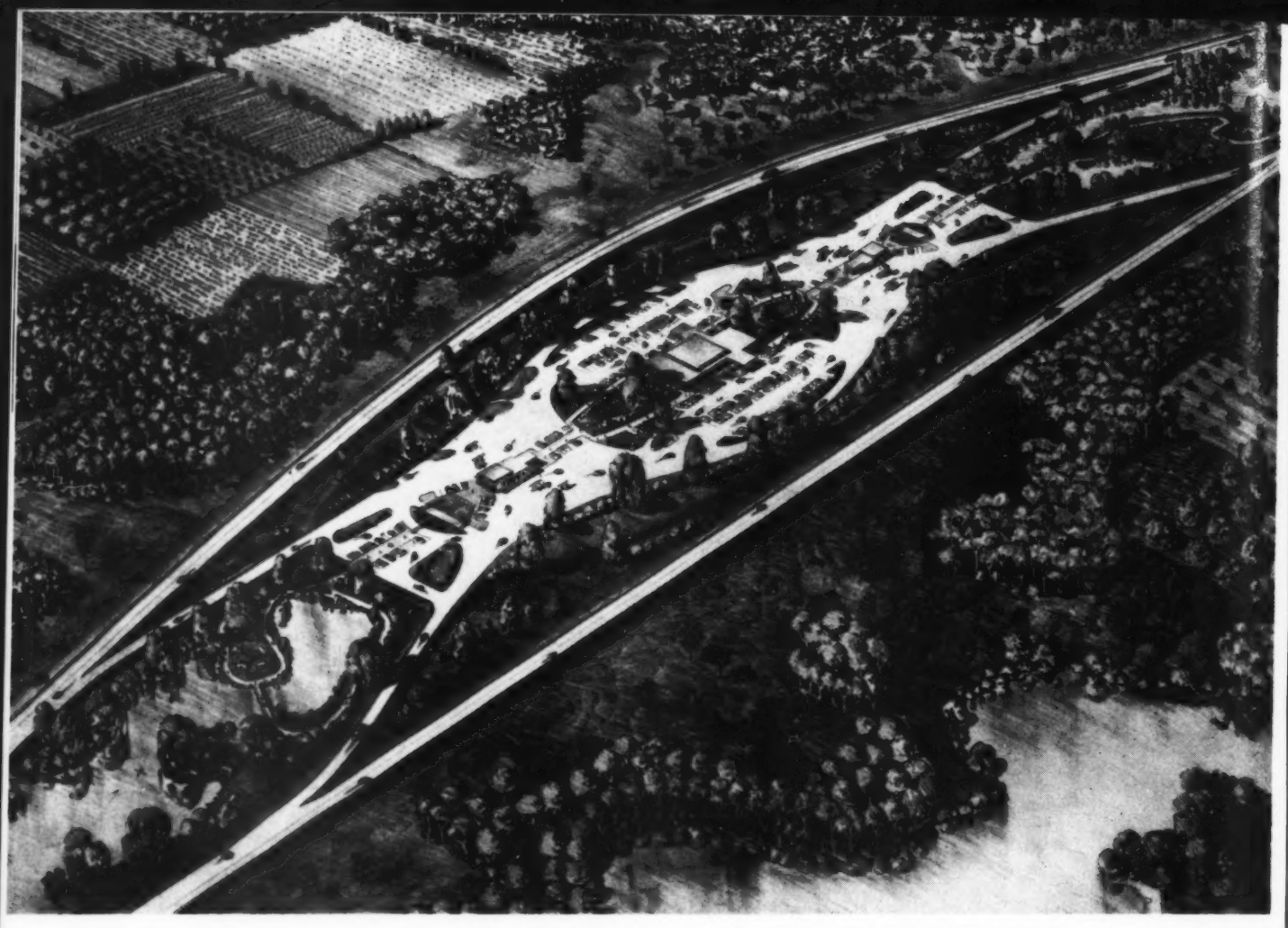
Congress, in the Federal Highway Act of 1956, declared it to be essential to our national well-being to provide for the early completion of this system of highways, adding the specific declaration that the system be completed, as nearly as practical, over a 13-year period. The entire system, in all the states, must be brought to simultaneous completion.

Formula For Distribution

The Act provided not only for its authorization, but also set up appropriations for financing the Inter-



ENGINEER'S SKETCH OF TYPICAL FREEWAY OVERPASS ON CLEVELAND'S WILLOW-INNER BELT INTERCHANGE.



SERVICE AREA ON THE SUNSHINE STATE PARKWAY, A 4-LANE DIVIDED TOLL ROAD FROM MIAMI TO JACKSONVILLE.

state Highway System, with appropriations totaling $24,825 million for the 13-year period. The division of cost for the construction of the system generally will be 90-percent Federal Aid and 10-percent state funds. Federal funds will be distributed during the first three years by a formula weighted on the basis of two-thirds for population, one-sixth for area, and one-sixth for total post road mileage within a state. During the last 10-year period of the 13-year program, funds will be distributed on the basis of need determined through periodic studies and estimates.

The Toll Road Period

In recent years, particularly during the period from 1947 to 1955, some impetus was given to needed highways through financing by revenue bonds. This inaugurated the "toll road period." The method first was used in the modern highway era in the construction of the Pennsylvania Turnpike, rapidly spreading to other states. Today, 18 states have toll roads in operation or under construction — Colorado, Connecticut, Florida, Maine, New Hampshire, New Jersey, New York, Oklahoma, Pennsylvania, Ohio, Indiana, West Virginia, Illinois, Kentucky, Kansas, Massachusetts, Virginia, and Texas.

Differences of opinion exist as to the future possibilities for toll roads. In most instances, the toll road locations lie in the same corridors for which the Interstate locations are planned. Not only did some states take the initiative in sponsoring and constructing these toll roads under public ownership and administration, but several other states constructed sections of toll free highways on the Interstate System, using state financing.

Reimbursement

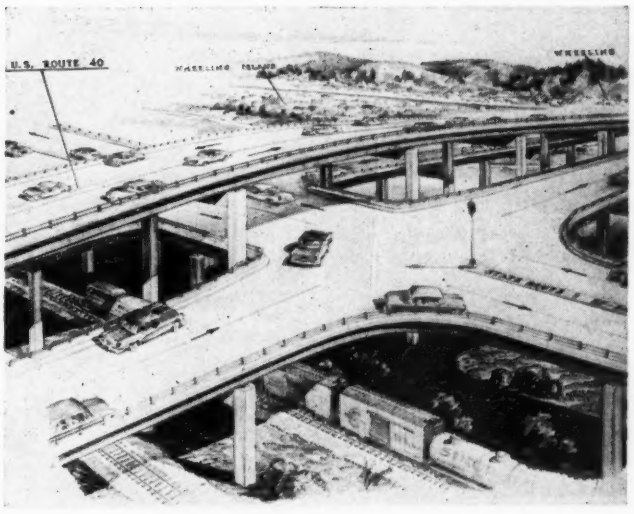
Congress, in the Federal Aid Highway Act of 1956, recognized the need to establish a policy with respect to reimbursement for this accomplished highway financing. Consequently, the Act declares it to be the intent and the policy of the Congress to determine whether or not the Federal Government should equitably reimburse any state for a portion of a highway that is on the Interstate System, whether toll or free, the construction of which was completed after August 2, 1947, or which is either in actual use or under construction by contract for completion, awarded not later than June 30, 1957, providing the highway meets the standards required for the Interstate System. The time, method, and amounts of such reimbursement are to be determined by Congress following a study to be made by the Secretary of Commerce, with a complete report to be submitted to Congress prior to June 12, 1958.

The completed toll roads have been recognized as a major factor in selling to the American public better type highway facilities. Afforded an opportunity to ride these limited access high-speed arteries of travel, the American motorist gave unqualified endorsement to the Interstate Highway System program to the extent that the debate in passage of the Federal Aid Highway Act of 1956 was confined primarily to methods of financing.

New Design Standards

Frequently it has been said that the engineer in the past never adequately provided for motor vehicular traffic. Recognizing this fact, Congress has requested standards of design and construction which only in a few instances have been met to date. Right of way on all sections of the Interstate System is to be secured with controlled access rights, and with minor exceptions, all highways will be of dual lane construction. Minimum median widths of 36 feet in rural areas will separate opposing lanes of traffic. All railroad crossings will be separated at grade, as will be all highway crossings — with but few exceptions in isolated locations. All known features of safety and utility are to be incorporated in each design. The initial design features will be such as to accommodate traffic anticipated for the year 1975. The design speed of all highways is to be at least 70, 60, or 50 mph for flat, rolling or mountainous topography. The design speed in urban areas is to be at least 50 mph.

When the Interstate System of Highways is completed in 13 years, the motorist will be able to drive to 90 percent of the large cities in the country without encountering a red light or a stop sign.

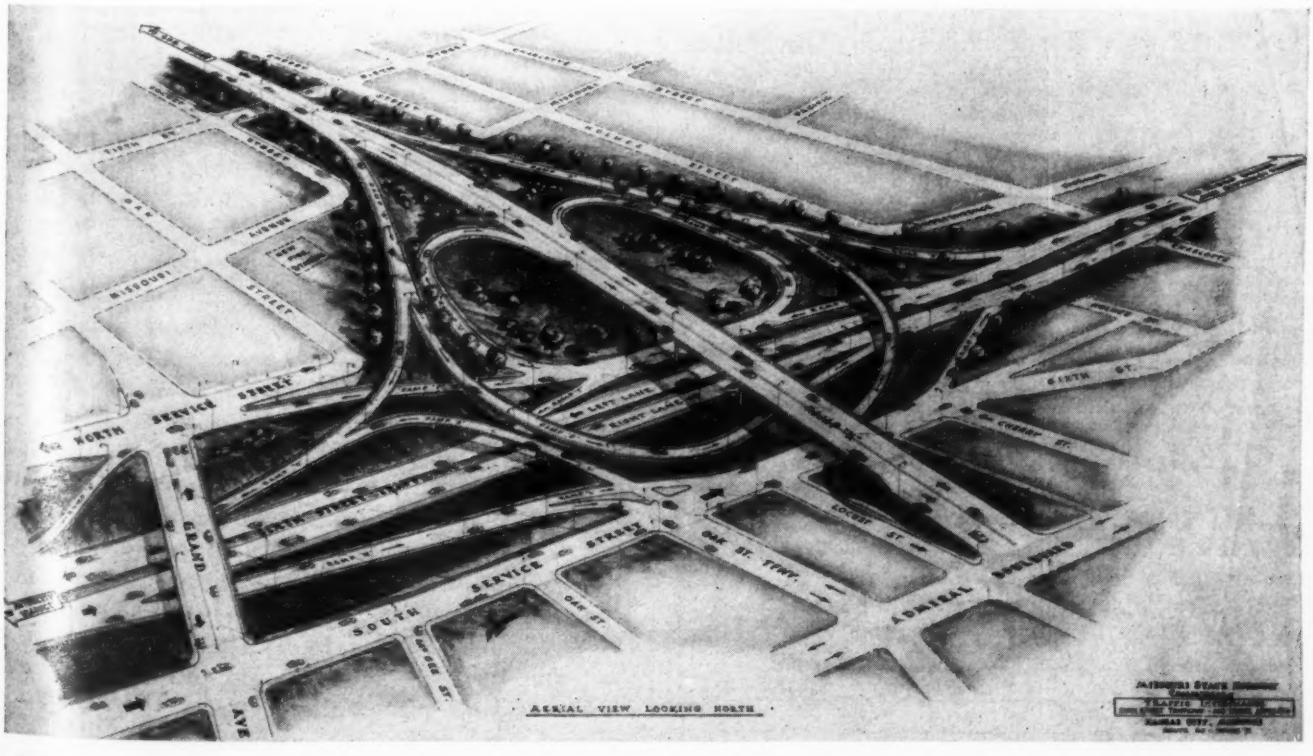


THREE LEVEL INTERCHANGE BETWEEN U.S. ROUTE 40 AND OHIO ROUTE 7, WHEELING ISLAND-BLAINE, OHIO.

The 1956 Act also provided for modernizing and expanding the primary, secondary, and urban highways systems through matching of Federal funds by states on a 50-50 basis.

Increased Taxes

Financing of the highway program will be accomplished by increasing the Federal tax on gasoline, diesel fuel, and special motor fuels by 1¢ per gallon; by increasing the tax on tires by 3¢ per pound; and



AERIAL VIEW LOOKING NORTH AT TRAFFIC INTERCHANGE FOR ROUTE 40 AND ROUTE 71 IN KANSAS CITY, MISSOURI.

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Only MAGNETROL design can provide up to three completely separate switch mechanisims, each operating at its own level, in a STANDARD control. Use extra switch for "stand-by" pump for emergency use; or alarm BEFORE fuel cut-off; or high level alarm; etc.

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Once-a-shift blow down and once-a-month visual inspection of switch housing are only regular maintenance. *Built SAFE, Magnetrols stay SAFE.*

A magnetic sleeve, raised and lowered within a non-magnetic tube, "trips" or releases an Alnico permanent magnet attached to a mercury switch. Basically, this is Magnetrol.

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by increasing taxes on new trucks, buses, and trailers. Retread rubber will be taxed at 3¢ per pound, and vehicles weighing more than 26,000 pounds will be taxed at a rate of $1.50 per thousand pounds.

It is estimated that the average highway user will pay about $8.60 per year in taxes for the financing of this highway program. Assuming that this average motorist travels 9400 miles and assuming that the 1¢ per mile reduction on operation cost over the improved highways is accurate, he will save $94.00. This will leave him a net of $85.40 ahead.

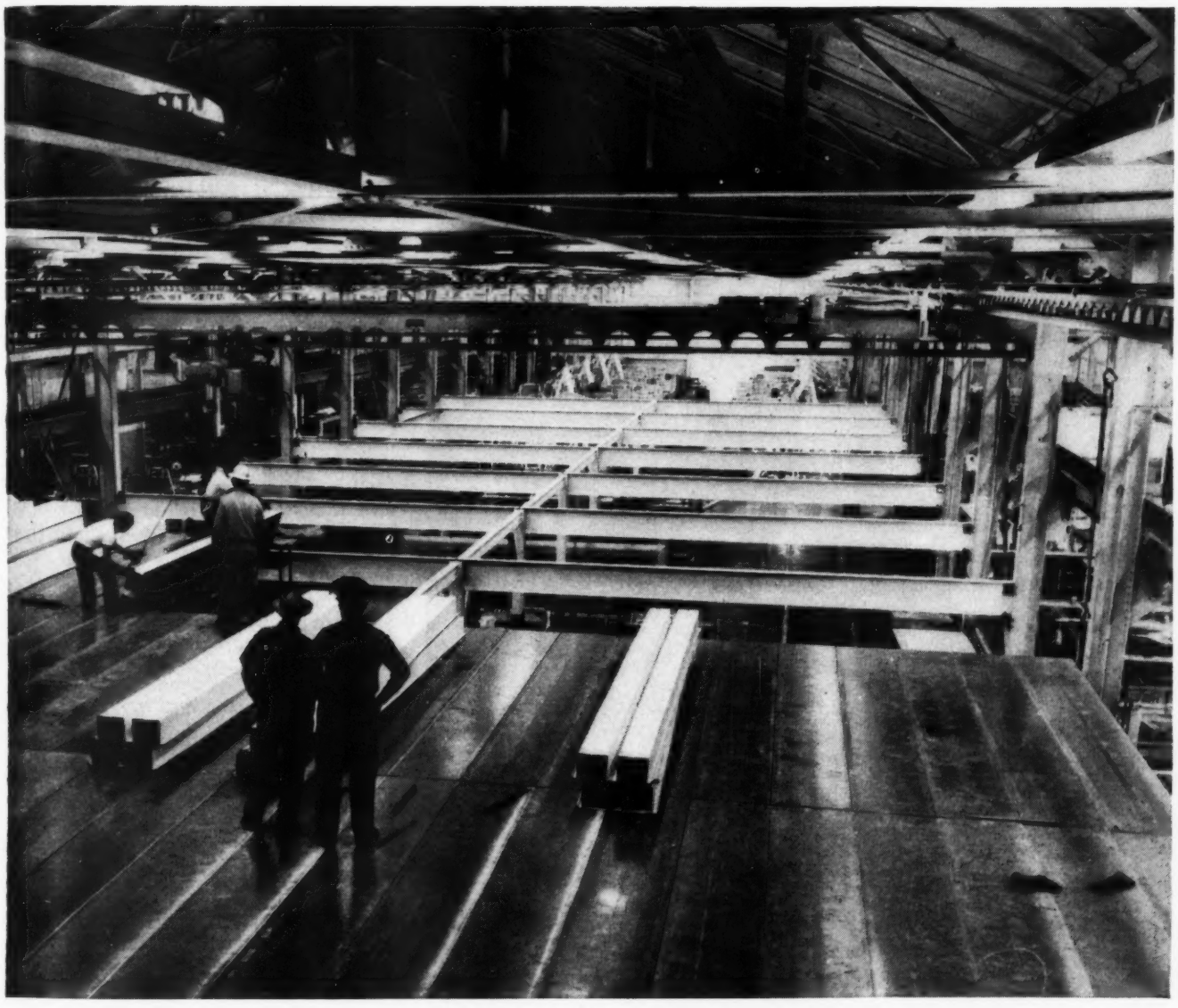
Savings in Lives

Savings in time and money are insignificant as compared to savings in lives and injuries. Last year closed with some 41,000 persons killed on the highways during the year, another 1,350,000 injured, and 100,000 permanently disabled. The rate of fatalities is about 6.4 deaths per 100-million miles of travel. Even maintaining this figure we can expect, in 10 years with a predicted 50 percent increase in traffic, that there will be 60,000 fatalities a year in place of the 41,000 for 1956. In the 54 years we have had the automobile, over one-million people have lost their lives on highways.

The present rate of travel in the United States is some 600-billion miles per year. An Interstate Highway System would carry 25 percent of travel or 150-billion miles annually. The fatality rate on the limited access type of highway at the present time is approximately one-third of the national average, or about 2.2 fatalities per 100-million miles of travel. About 4.2 lives per 100-million miles of travel would be saved with the Interstate Highway System completed, or a total of over 6000 lives per year.

The Consultant's Job

The consulting engineer, specializing in highway and bridge design, will be called upon to participate in the engineering of this vast program. The problems of economical location, of right of way acquisition, and design for traffic movements will tax the ingenuity of the designer. The new features of highway design involved in urban expressway development will require extensive studies to obtain approvals of interested public agencies. The shortage of engineers and the limited time within which Congress has declared that this program shall be completed will call for maximum use of the services of qualified engineers. The program involved will be the largest public works effort ever to be undertaken in the history of man. The highway engineering agencies of the federal, state, and local levels are confronted with a task in which they cannot fail. Congress, through the passage of the 1956 Act authorizing this immense program and providing for its financing, has placed the challenge for its completion at the door of the engineers and the highway contractors. ▲▲



Fenestra Industrial Mezzanine under construction at Douglas Aircraft Co., Torrance, California.
Architect: Van Dyke & Barnes, Los Angeles. *Contractor*: W. R. Steyer Co., Los Angeles.

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In the photo, above, you can see how easily Fenestra Building Panels are erected without disturbing production. They form the structural subfloor for the mezzanine with a minimum depth. A concrete pad about 2½" thick with mesh reinforcement is poured on top of the panels to distribute any concentrated load. Fenestra Metal Wall Panels and Steel Windows may be used to enclose the mezzanine space. If you need to provide more space in an existing plant, call your local Fenestra Representative. He can give you complete information. Or, mail the coupon below for your FREE copy of the 1957 Fenestra Building Panel Catalog that gives you complete design data.

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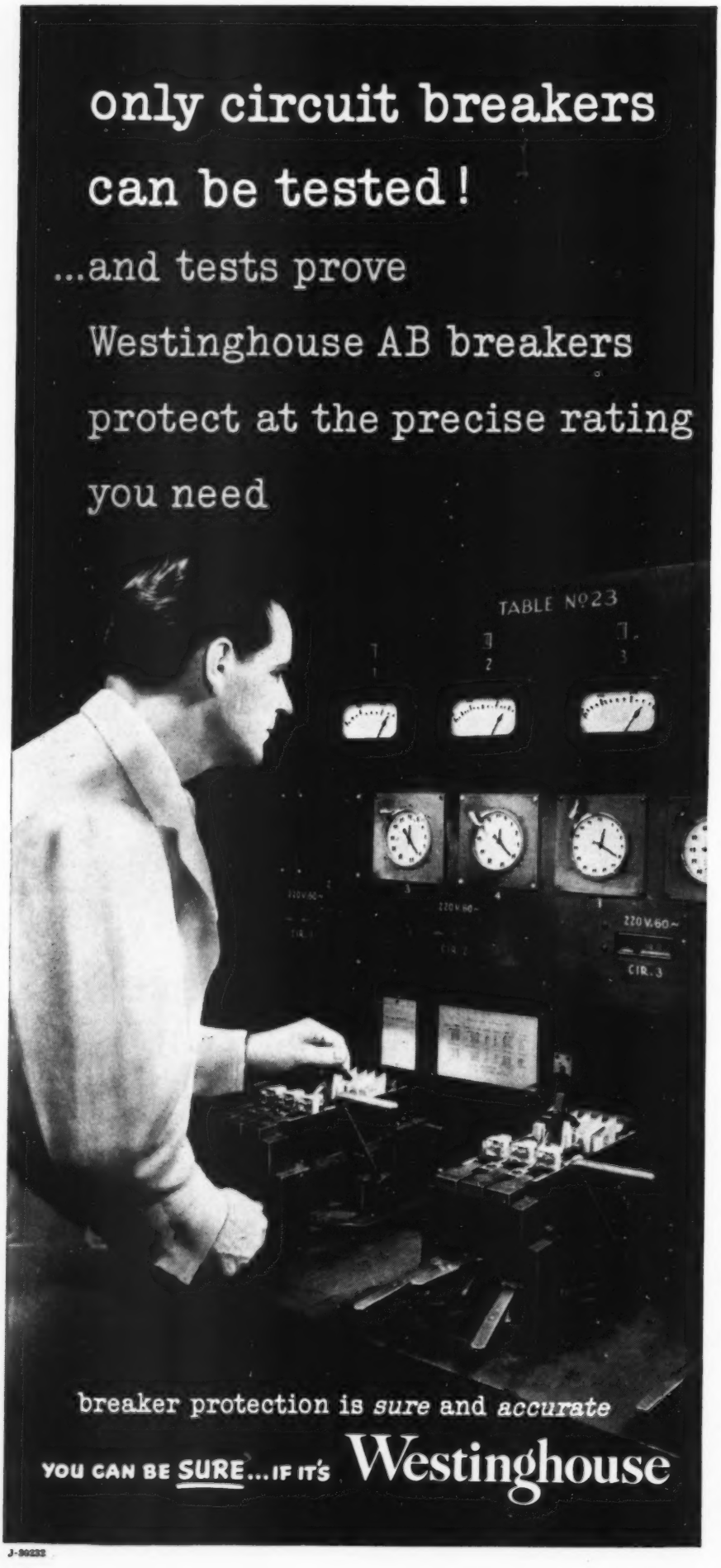

PRE-TESTED CIRCUIT PROTECTION IS "INSURANCE"

by H. D. Dorfman
Westinghouse Electric Corporation

A most important consideration in selecting a circuit protective device is its ability to protect at the precise rating for which it is designed. Under-rated devices are nearly as bad, though not as hazardous, as over-rated ones. Load testing is the only positive way to be sure a circuit is truly protected.

Obviously, fuses cannot be calibrated and load-tested. An operation-tested fuse is like a tested match, of no further use. Thus, precision protection may not be assured.

Circuit breaker accuracy can be tested by the manufacturer before shipping and retested, if desired, in the field. When tested breakers are provided by a reputable company, you can be sure they will protect at exactly the rated load.

Heat-Treating Important

A number of factors distinguish the properly designed and tested breaker. Life-long maintenance of calibration is assured by several preliminary steps. Heat-treating of bimetal subassemblies relieves any stresses set up during manufacture and insures their permanent "set." Failure to heat-treat can result in later destruction of calibration by load cycles.

Latching surfaces should be ground and polished to eliminate erratic tripping. Latch members also should be heat-treated to prevent wear and distortion. To insure perfect mating of parts, the production and assembly of circuit breakers should take place in a temperature and humidity-controlled area.

Tests Verify Calibration

These tests conducted on all Type F breakers made by my company, for instance, typify the painstaking care necessary to assure the protective quality of such devices.

1. Magnetic elements are adjusted to trip at ten times the thermal rating.
2. After pre-setting of calibrating screw, thermal elements are tested to trip the breaker at a specific overload, within strict limits.
3. Only after the second successful thermal tripping run is the cover assembled on the breaker.
4. Following a 5,000-volt insulation check, the thermal calibration is again test-verified to determine that bimetal calibrations were not altered before or during breaker cover placement.

Such tests assure positive circuit protection at the precise rating for which the circuit breaker is designed.

Take-Off Time is Near

Consulting Engineers' 1957 European Tour leaves May 11 for 30 days in England, Ireland, France, Italy, and Spain. It is a trip you cannot afford to miss.

IT TAKES THREE TO FOUR WEEKS to get a passport, and take-off date is May 11, so you have no time to waste. Call in your secretary and ask her to get your passport applications. All she has to do is go to the local county courthouse and pick them up. Then, have her send the telegram on the bottom of this page, and you are as good as on your way.

This year's Consulting Engineers' European Tour will mean more to you, as an engineer in private practice, than you can imagine. It will give you an opportunity to visit in the offices of prominent European engineers, study their design methods and projects, and discuss with them their solutions to the many problems of professional practice.

This is a business trip you cannot afford to miss. It will pay off many times its cost, as those who went on last year's Tour can confirm. If your wife would like to go along, she will find pleasant companionship and a special ladies' program surpassing her expectations.

The schedule shown on this page can be adjusted to any changes you would like to make. If you want to make a side-trip not shown on the itinerary, that can be arranged. On this tour everyone is an individual. You are not just one of a group. The price is surprisingly low, and accommodations are deluxe or first-class. Furthermore, this is a business trip, so you should handle the costs as a business expense, or just as you would any other business trip.

The price of the Tour is $1585 per person, which includes first-class air transportation, hotel, baggage handling and all meals at meetings with consulting engineers as well as breakfast every day and one other meal per day in Paris and Rome. A deposit of $100 per person holds a reservation.

Tour Itinerary

May 11	Leave International Airport, New York
May 12	London, 4 days
May 15	Dublin, 3 days
May 18	Paris, 6 days
May 24	Milan (Side-trip to the Riviera or to Switzerland — 3 days)
May 27	Milan, 3 days
May 13	Rome, 5 days
June 4	Madrid, 4 days
June 8	Leave for New York

All flights are First-Class, all hotels are First-Class or Deluxe.

The group will be limited to a total of 30 persons. A multi-lingual guide will be with the group.

WESTERN UNION

Consulting Engineer, St. Joseph, Michigan

We will be on the Tour this year. Letter and deposit being mailed today.

Mr. (and Mrs.) _____

Firm Name _____

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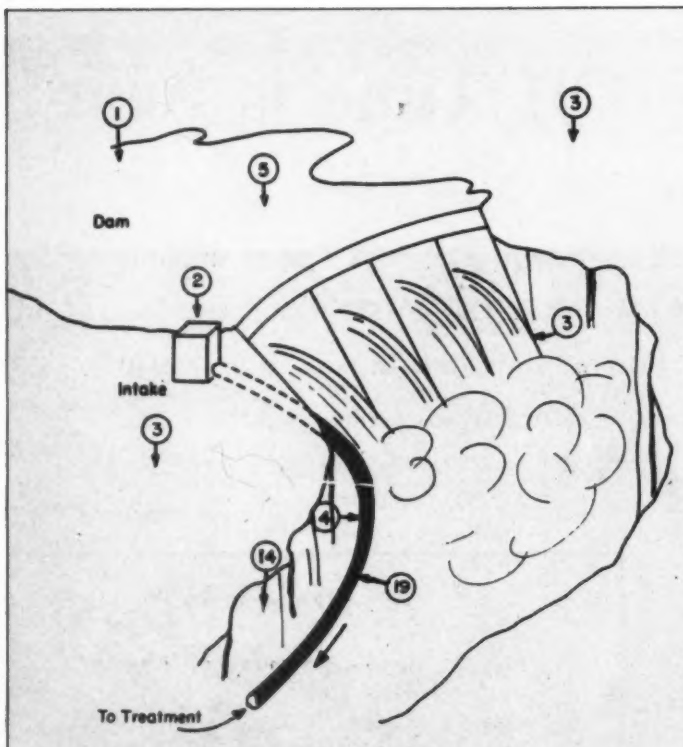

A Guide To Arctic Water Works Thermology

AMOS J. ALTER

Amos J. Alter has been engaged in sanitary engineer work in Alaska for 13 years. He is currently chief engineer for the Alaska Department of Health and administrator for the Alaska Water Pollution Control Board. A graduate in civil engineering from Purdue University, Mr. Alter took additional graduate work at the University of Michigan and has studied Arctic sanitary engineering in Norway, Sweden, Finland, and other parts of Europe. He is a member of the Cold Weather Construction Committee of the American Society of Civil Engineers.

IN THE DESIGN of Arctic water works, heat is significant. Heat transmission, heat utilization, and heat conservation actually overshadow the usual hydraulic and structural design features. In fact, study and practice show some features of normal water works design to be unsound thermally for use in the Arctic.

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Thermal Problems

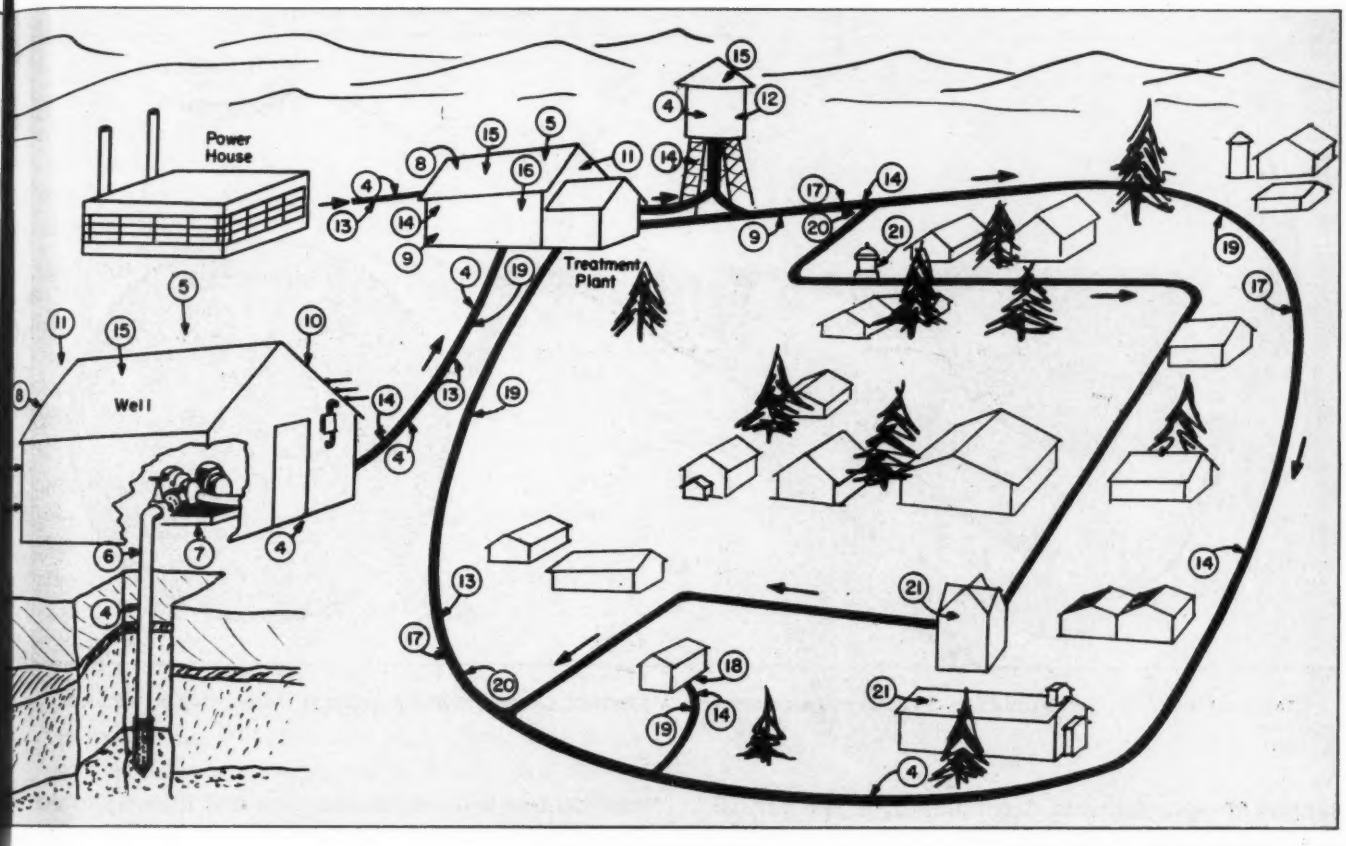
Many special problems confront the consulting engineer working with Arctic water works design and operating problems. The consultant must be aware of the need for favorable heat balance in every part of the water works, and he must understand the measures necessary to prevent structural damage due to uncontrolled heat. Although there is need for further research in Arctic water supply techniques, empirical methods and information now available form a sound basis for design and operation.

Data on heat sources, heat transmission, insulating materials, ventilation, and air conditioning performance are available from manufacturers for their particular products. Heating and ventilating engineers have gathered much data on control of condensation and vapor. Geologists and soil scientists have done a great amount of work on the classification of permafrost and on the essential features of Arctic foundation design.

Experience is a Guide

At least three centuries have elapsed in which observing circumpolar residents gradually have adapted the design of their housing to the low temperatures. All new materials and all new structural concepts should be studied in the light of these experiences. Exposure, type of roof, method of wall construction, type of windows, heating, and ventilation all should be analyzed for each building.

The steps in development of a design for an Arctic water works are simple. The suitable site is selected after evaluation of climatological data, permafrost, soil conditions, general geological features, and the



disciplines of the area. Summer and winter site studies are necessary. Examination of all materials, processes, and methods is necessary to determine their applicability under Arctic conditions.

Reference Drawing

Arrows on the drawing show some of the most critical points in an Arctic water works system. The following numbered comments refer to the numbers on the sketch.

(1) Permanently frozen soils on water sheds, and the semi-arid conditions prevailing in many parts of the Arctic, tend to make runoff flashy. Minimum stream flows are most probable in months of coldest weather and in late winter. Inadequate rainfall and runoff data make design of storage and impoundment works difficult. The thick ice layer which starts to build up with the first freeze constitutes an appreciable portion of the stored water.

(2) Intake design must protect against ice damage and minimize complications from frazil ice formation. In some instances, it has been necessary to provide a heat supply at the intake to prevent it from choking with ice spicules.

(3) Large bodies of water and changes in movement of water through the soil disturb the normal thermal regimen of the site, and this must be studied and considered in design of the dam. Changes in thermal regimen may destroy permafrost and create unstable soil conditions both in and around a dam.

(4) Heat losses from transmission lines and storage tanks must be considered, and if the initial heat of the water is insufficient to satisfy heat losses under the coldest conditions, either heat losses must be reduced by protective features or provisions must be made for addition of heat. The choice depends upon construction costs necessary to obtain a heat balance compared with operation and maintenance costs.

(5) Supply and treatment facilities should be located near available sources of waste heat. Power plants, or in small installations, even the waste heat from the cooling system of a motor, are worth conserving, and heat from these sources has been used in several Alaskan systems. However, safety of the water must not be jeopardized in an effort to utilize waste heat. Some chemicals used in boiler water treatment contain toxic materials or are contaminated and may not be injected directly into potable water. Heat exchangers must be designed with materials, pressure, and operational features that will preclude potable water contamination.

(6) Ground water supplies from supra-permafrost sources may not be reliable in yield, and intra-permafrost or sub-permafrost supplies must be studied to determine appropriate pumping rates. Rates must be low enough so that the aquifer is not drained to such an extent that it will freeze. Change in the heat balance in the aquifer may be either detri-

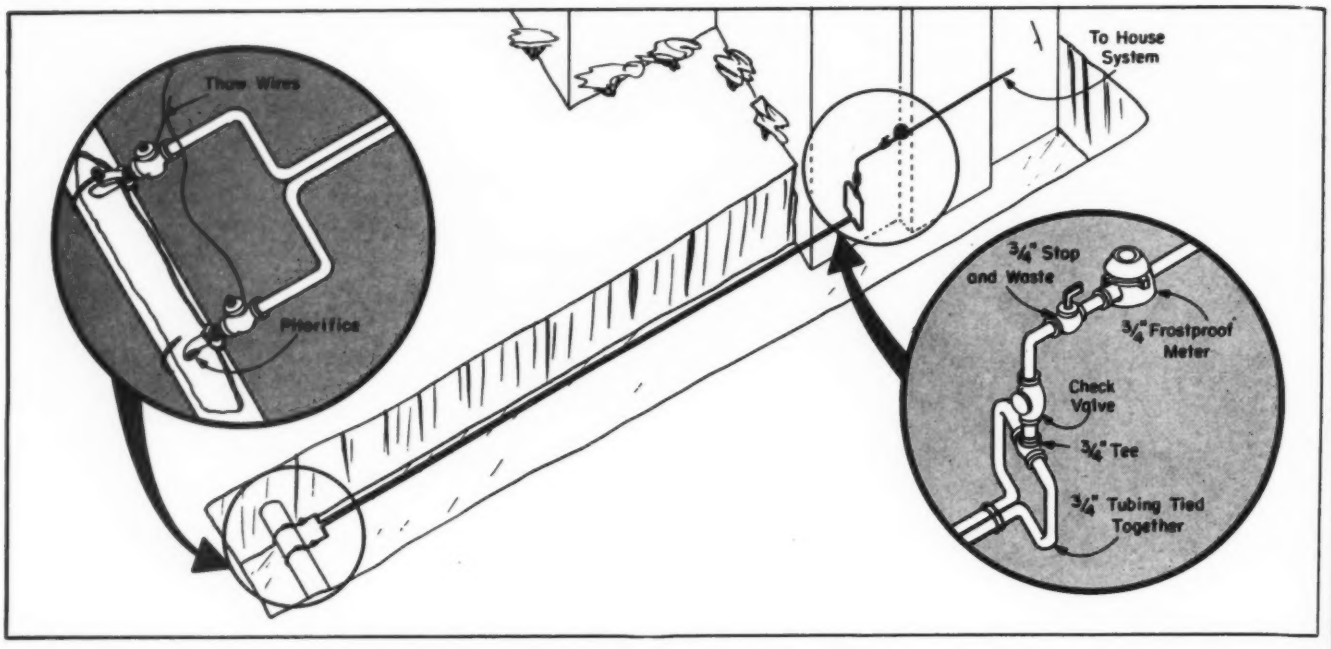


DIAGRAM SHOWING DETAILS OF A DOMESTIC TAKEOFF FOR A RECIRCULATING WATER SYSTEM IN AN ARCTIC REGION.

mental or advantageous, depending upon the normal thermal regimen at the site.

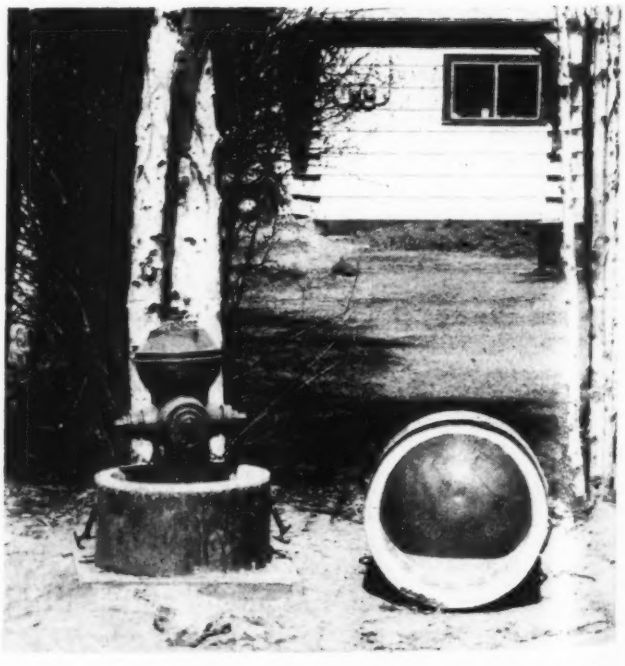
Sufficient heat must be provided in the well casing to satisfy heat losses at points where the casing passes through frozen soil. Heat losses in the well may be satisfied by heat from the water being pumped or by addition of heat from other sources.

(7) Casing head construction presents several problems. Loss of heat from the casing enclosing structure and the well must be minimized, and at the same time a stable footing for pumping must be provided to prevent entry of contamination into or along the well. Conventional pit or concrete slab construction permits excess heat losses and creates freezing or structural stability problems. The drawing of an Arctic casing head shows a satisfactory type of construction.

(8) Weatherproof structures with adequate insulation and effective vapor barriers must be built to protect the well, pumping equipment, and treatment plant. Tie bolts, nails, or other materials that are good heat conductors must not extend from the interior to exterior walls. These measures help prevent condensation and severe icing within the structure. Double or triple glazed windows with framing constructed of materials that minimize heat loss are indicated under severe temperature conditions.

Provision must be made to minimize condensation and icing on and around doors leading into a heated structure. Icing around doors has been minimized by the use of vestibules which are unheated and the use of curtain type closures for the inner door. In some structures, entry is through more than one successively warmer zone. In the Fairbanks water treatment plant entry is through a vestibule into a cool basement or semi-basement zone and then up to the floor above, which is the main floor of the structure. Proper orientation of the entrances and exits also will reduce snow blockage.

(9) Foundation design must be adjusted thermally to the site conditions. Structural stability must be analyzed in view of the ultimate effects of heat loss from the structure. Design and construction techniques tending either to destroy or to maintain permafrost conditions at the site may be employed.

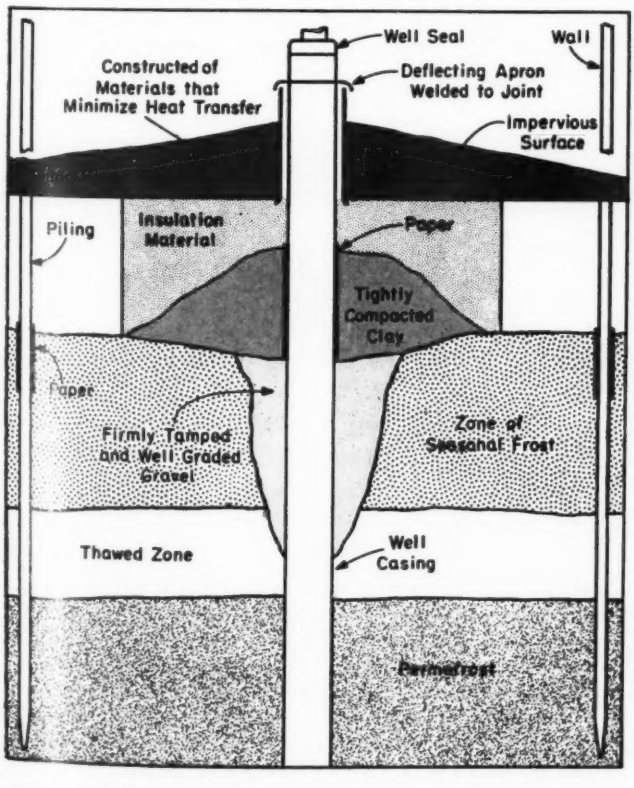


IN ARCTIC AREAS IT IS NECESSARY TO PROTECT FIRE HYDRANTS WITH INSULATED COVERS AS SHOWN HERE.

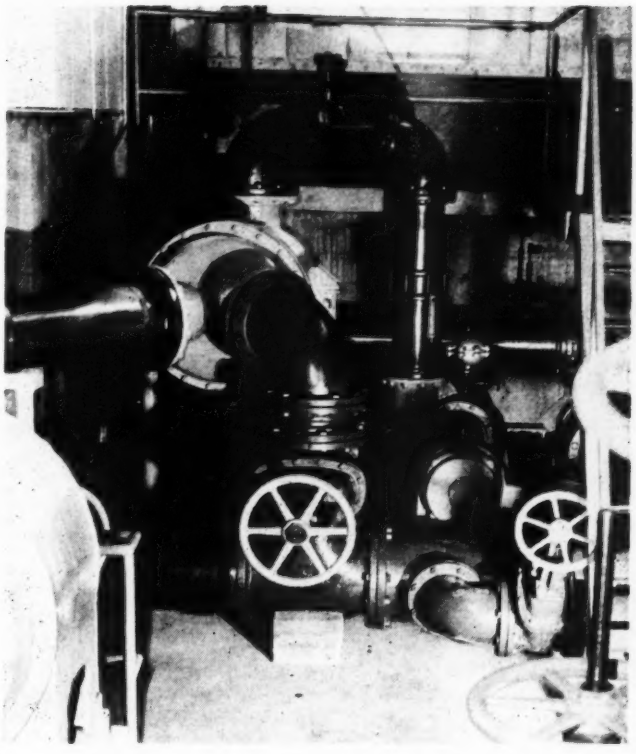
Choice of method depends upon soil and soil temperature conditions and the use requirements of the building. For example, where dry permafrost exists in materials that are relatively of the same stability whether frozen or thawed, waste heat will not materially effect the structure, and any structurally suitable foundation can be used. If the structure of the soil is such that upon thawing it loses its stability, then it must be kept frozen or a piling or mat type construction must be used to support the structure.

The cost of energy to keep a site frozen as well as the cost of additional construction features such as compressors and insulation must be evaluated in relation to the cost of piling or mats to determine the most economical design. In general, where permafrost exists at a temperature of above about 26 or 28 F, it is not likely that it will be economical to try and preserve the permafrost by use of refrigerants and cooling systems. Physical properties of the soil, ground water movement, and power and construction cost will vary with each site. No general rule can be applied without relating all factors.

Improper site development and foundation design may permit collection of water under and around footings, under floors, and in below-grade portions of the structure. Heat losses create a thawed area which may serve as a drain for the egress of suprapermafrost artesian water under the structure. If the building is unheated for a period of time following the collection of this drainage water or the heat balance is such that the water continues to flow and freeze as it issues from the soil, heaving and other severe freezing damage to the structure may result.



THIS DRAWING SHOWS PROPER CONSTRUCTION OF A CASING HEAD FOR A WELL DRILLED IN PERMAFROST.



A HEAT EXCHANGER INSTALLATION LOCATED IN THE WATER TREATMENT PLANT AT FAIRBANKS, ALASKA.

(10) Heat balance and design of electrical entrance facilities such as conduits, switches, and circuit breakers should be such as to minimize operational problems resulting from condensation and icing. It is necessary to avoid the location of switches, meters, and control equipment on exterior walls. All of this type of equipment should be located in a well-heated area. It also is necessary to use conduit materials with a low K factor.

(11) Space heating requirements and the necessity for ventilation and moisture control should receive special consideration. In some instances standby heating equipment and alarm systems have been employed.

(12) Energy and structural requirements of heated elevated storage, and ground storage and additional pumping equipment should be compared to determine the most economical and practical methods to maintain pressures and satisfy fire demands.

(13) All transmission and distribution pipelines should be designed and constructed so that they may be drained during periods when heat requirements of the system cannot be supplied either by the water in the system or by adding heat to the system.

(14) In choosing the type of material for water lines and in selecting jointing methods, the suitability of each material should be considered in relation to its heat transmission characteristics and the effect of

freezing and thawing. These considerations are in addition to the usual decisive factors of economy, availability, and function.

Where thawed soil conditions are unstable, heat loss from pipes may cause sagging and heaving unless appropriate structural methods are employed to minimize such damage. Rigid pipe installed in lengths as long as possible between joints is best. Welded steel pipe has been used in many instances. Piling also has been used to provide support in maintaining vertical alignment.

Differential heaving and thawing tends to damage relatively brittle materials. Wooden pipe has been used with success where it is not directly exposed to an intense heat source during periods when it is drained. Wood pipe naturally has a lower K factor than metal pipe, but appropriate insulation has been provided for steel pipe to lower the K factor.

Since electrical thawing methods are common, the pipeline should be constructed so that these methods can be applied. Electrical conductor wires may be placed at joints and in pipes in such a fashion that they are quite effective in thawing if appropriate consideration is given to preventing conditions that encourage deterioration of the material through electrolysis. Metal pipes jointed with poor conductor type jointing compounds may fail at the joints when thawed electrically, and the jointing compound may break down and cause sulfurous tastes and odors in the water. Wooden pipe, once frozen, can be thawed and reused, while cast iron, asbestos cement, and to a great extent steel pipe no longer are serviceable after freezing.

(15) Roof construction should provide for control of icing where heat loss occurs and sufficient condensation or thawing takes place to permit formation of ice. Vents or flues carrying warm moist air will cause icing conditions that may result in damage not only to the vent but to other parts of structure.

(16) Aeration, chemical dosage, mixing, flocculation, and settling facilities should be designed to treat water efficiently at low temperatures, or sufficient heat should be added to the water to assure efficient treatment under normal temperature conditions.

(17) Unless water is distributed through heated conduits with other utilities such as steam and telephone lines, it is necessary to provide means for adding heat to the water distribution system to satisfy the heat losses. Bleeding water from the system; heating the water and recirculating it; placing steam tracers beside the mains; or utilization of steam conduits for protecting the mains all have been used. Analyses of heat losses, heat requirements, initial construction costs, operational difficulties, consumer requirements, and operational costs should be made before deciding upon a design for distribution. Recirculation of water in the system adds even greater significance than normally is attached to cross-connection and back-siphonage conditions, and such conditions must be eliminated in designing the system.

(18) Protection of the service connection is probably the most critical point in most Arctic systems, and this has been handled in various ways. Bleeding water, thermal taps such as pitorifices, pumps, and heated conduits all have been used. An accompanying sketch shows a pitorifice installation. "Pitorifice" is a word coined from "pitot tube" and "orifice." This idea first was suggested by the Alaska Department of Health in some preliminary Arctic water works designs, in 1948. It is a modification of the fitting used to connect radiators to the hot water supply system of a single pipe recirculating type hot water heating system. The Alaska Department of Health called the design a "Thermal Tap" service connection, but the Arctic Health Research Center, after it perfected the device, called it a "Pitorifice." It is not patented. The first, and perhaps the only system-wide use of this device is in the Fairbanks, Alaska, water system. In this installation, the devices were shop made from standard copper tubing.

(19) It is desirable to install thaw wire connections to permit ready electrical thawing of house services as well as mains.

(20) Balancing flow of heat through a water works system so that the heat requirements of all parts of the system are supplied is a complicated job. Dead ends must be eliminated, and the network must be hydraulically designed to assure appropriate flow of water to all parts of the system if a recirculating type is employed. The McElroy analyzer has been used by at least one consulting engineer in designing such a system. Pipe sizing, heating, and pumping rates can be adjusted to provide the water needed and to satisfy heat requirements.

(21) Fire hydrants and fire lines must be designed to prevent freezing. Heat requirements in some instances have been met with weatherproofing and heating, draining and filling with antifreeze, electrical heating elements, or other heat sources such as steam lines or oil heaters. In small systems compressed air has been used to displace the water. Heat losses also may be minimized by choice of location for hydrants. The water supply easily may be contaminated through fire hydrants unless all connections are eliminated between sewers and water lines or water lines and sumps, pits, or poisonous antifreeze compounds.

The Arctic Viewpoint

Every feature of the Arctic water works system must be viewed by the designer and consultant as a potential heat problem. Thermology applied to Arctic water works design is not new, but the extent of its ramifications becomes more evident with each failure. Available heat in all parts of the water works must be sufficient to satisfy heat losses and so controlled that the stability and function of each water works feature is not impaired. ▲▲

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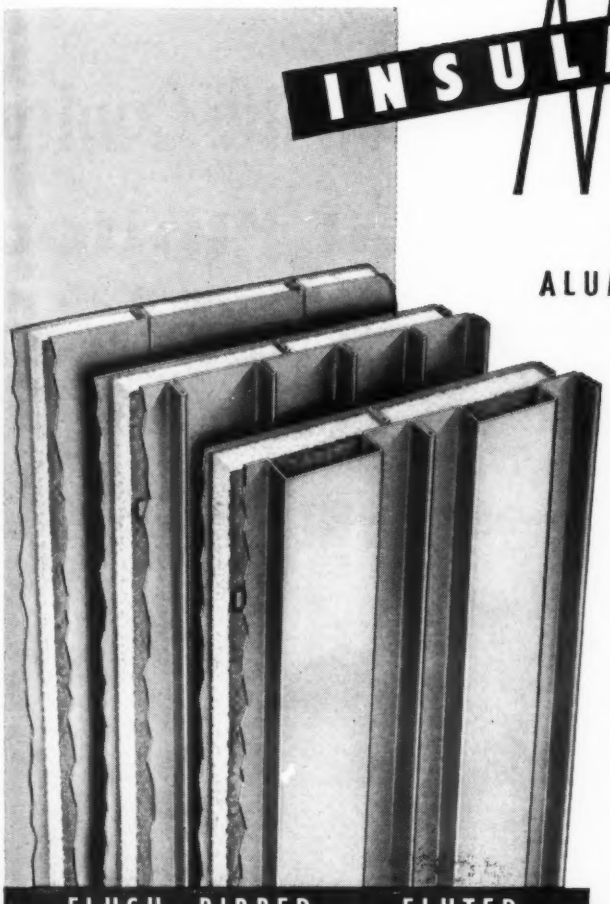

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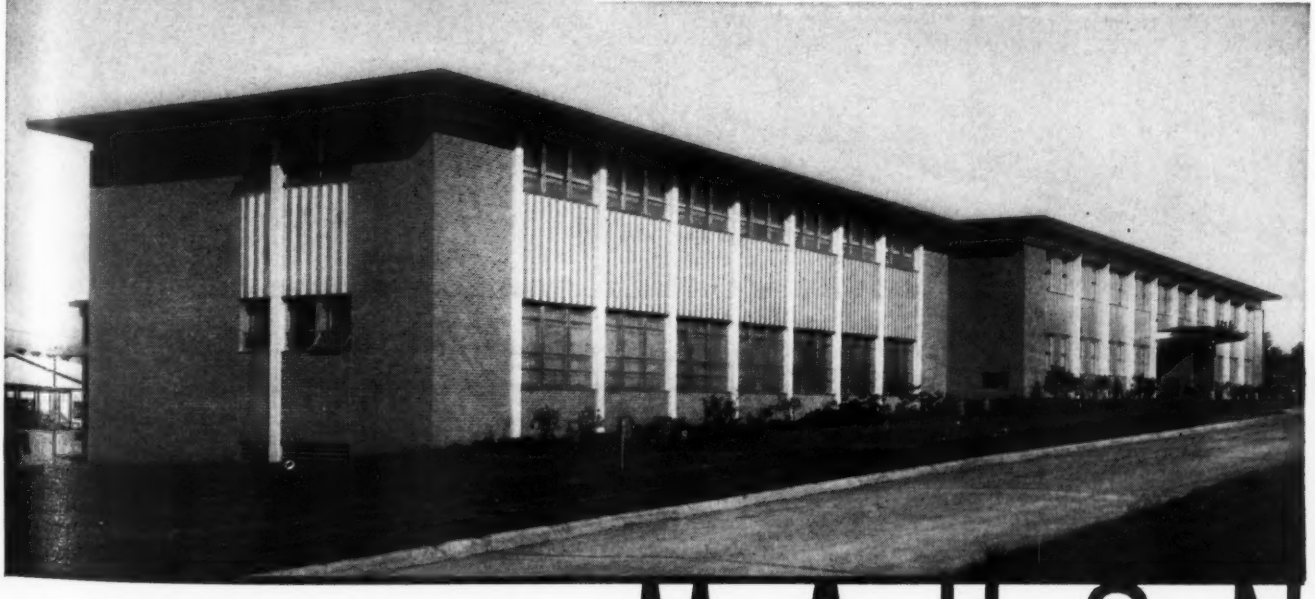

Modern Office Building for The Kansas City Southern Ry. Co., Shreveport, Louisiana. Neild-Somdal Associates, Architects. Southern Builders, Inc., General Contractors. In this Office Building, the Architects have combined Brick, Limestone and Embossed Aluminum in the exterior design to achieve the desired effect.

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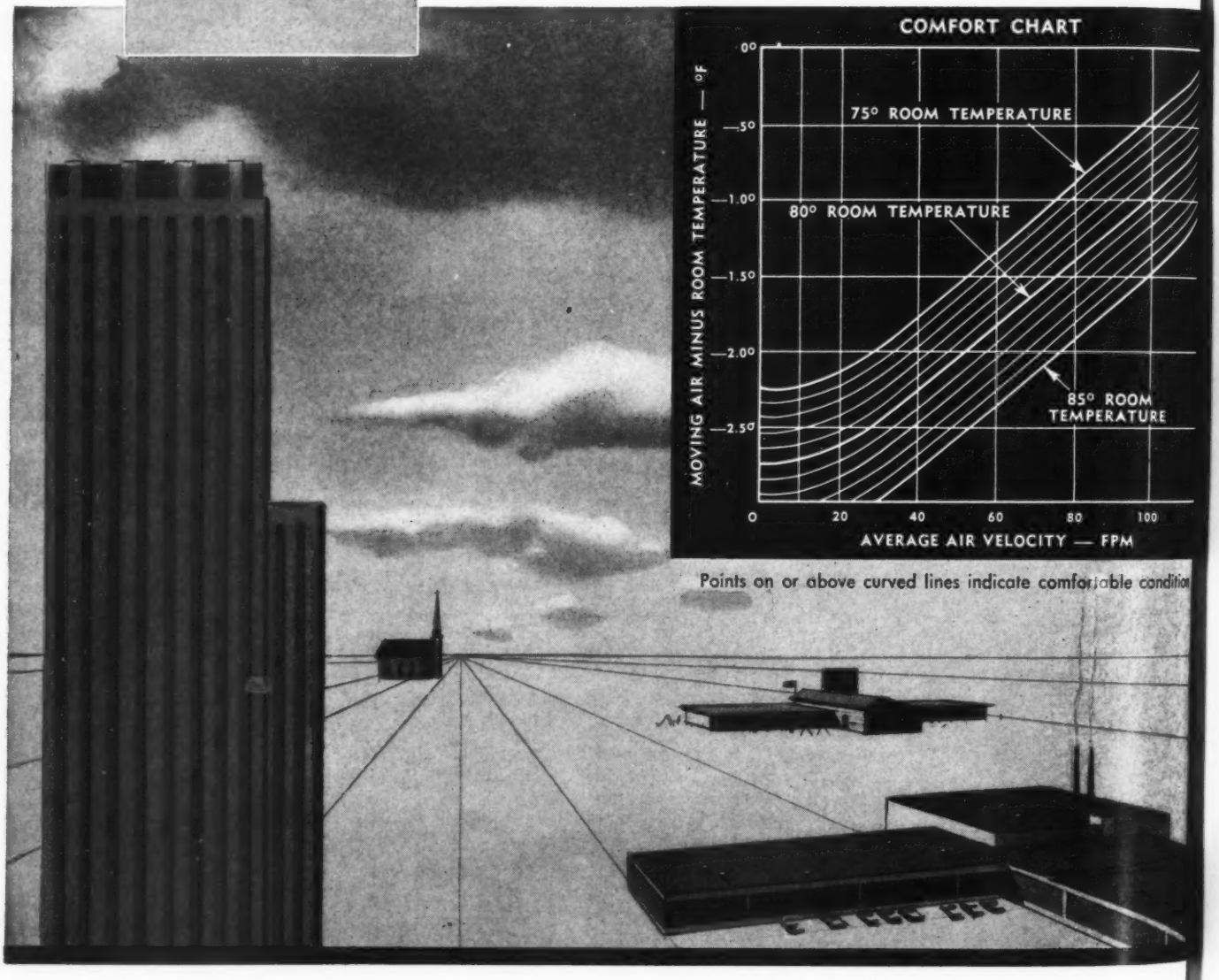

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THERMOSTATS Room and remote bulb types.

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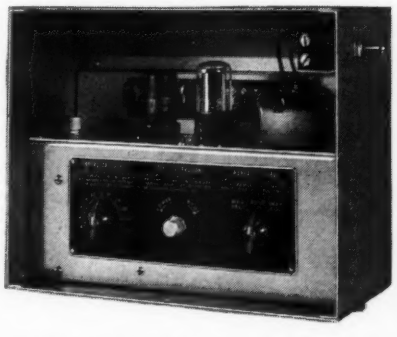

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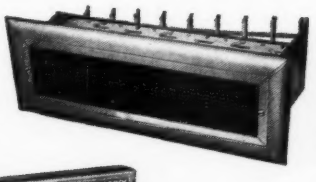

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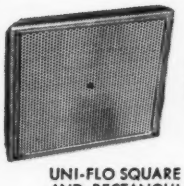

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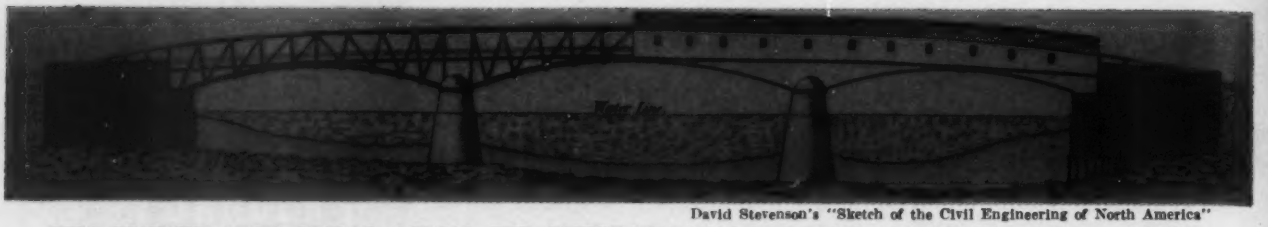


David Stevenson's "Sketch of the Civil Engineering of North America"

THIS TRUSSED ARCH BRIDGE ACROSS THE SCHUYLKILL WAS THE FIRST COVERED BRIDGE IN AMERICA.

Covered bridges are still being built today, but the 19th century was the real heyday of ——

America's Covered Bridges

RICHARD SANDERS ALLEN

THOUGH LONG considered obsolete, there are still nearly 2000 covered wooden bridges in North America. Off the beaten track for the most part, covered bridges carry traffic in 30 states and four provinces of Canada. There are even two in Alaska, and a few in Mexico and Guatemala.

CE exclusive

Truss Designs

From an engineering standpoint, interest in covered bridges centers not in the roofs and weatherboarding, but in the interiors — the varied truss designs that make up the actual bridge. Between 1797 and 1860 there were 51 patents issued for wooden bridge trusses. A look at some of these designs gives evidence of the very real accomplishments of our early, unschooled American bridge designers.

Early bridges in America were simple affairs of wood, a material readily available and workable. Nothing daring was attempted. Colonial bridges were crude trestles, with stringers set on a series of piles or a framework of bents driven into the river bottom. Such structures were swept away each spring by high water and ice. There was no time or money to attempt substantial bridges of stone.

Yet, swift and navigable rivers had to be bridged with longer spans in order to provide an unbroken network of transportation between the eastern cities. The best minds of the day set to work on the problem, scanning the works of the ancient builders, and reviewing everything available that had been written on the subject of bridges. Thomas Paine (1737-1809), the patriot and political pamphleteer, and Charles Willson Peale, (1741-1826), the eminent artist, received the first United States Patent for a bridge design, in 1797. These two experimented with bridge trusses by building models, some of them large enough to be tested as miniature footbridges. Building and testing models — loading them to the breaking point — was the accepted method used by the first American bridge designers. Neither Paine nor Peale got be-

Print published for Herrmann J. Meyer

WORLD'S LONGEST COVERED BRIDGE (5620 FT) OVER THE SUSQUEHANNA.

yond the model and paper plan stage, but up in Newburyport, Mass., a young shipwright's apprentice hit upon the right idea, and did something about it.

The Trussed Arch

The idea was to build wooden bridges in the form of an arch, an obvious one that for some reason had been forgotten for over 200 years. The shipwright's apprentice was Timothy Palmer (1751-1821), and it seems certain that he must have come across an old architectural book by Andrea Palladio (1518-80), an Italian Renaissance designer who had built some small wooden bridges in the 1550's. Palladio had devised his bridges for tiny torrents in the Italian Alps, but Timothy Palmer used the basic principle of the trussed arch to build great curved timber spans over New England rivers.

Palmer selected his own timbers, sometimes naturally curved, in the virgin pine forests, and had them floated downstream to the sites of his bridges. He put up three over the Merrimack River, in Massachusetts, one over Great Bay, in New Hampshire; and then went on to greener fields to bridge the Delaware River, at Easton, Pennsylvania; the Potomac, above Washington, D.C.; and the Schuylkill, at Philadelphia, Pennsylvania.

This last, finished in 1805, was called "The Permanent Bridge." Its arched roadway stretched across the Schuylkill in three spans for a total length of 550 feet. Built by a private company, it was a good business venture from which the tolls collected more than reimbursed the promoters. The president of the company, Judge Richard Peters, insisted that a roof and weatherboarding would give the bridge a longer life. Palmer took a dim view of the idea of covering, since he wanted his white pine timber trusswork to be prominent, but he lost out. They even went so far as to sprinkle stonedust on the fresh paint of the lower part of the woodwork to give the appearance of masonry. "The Permanent" was the first known American covered bridge.

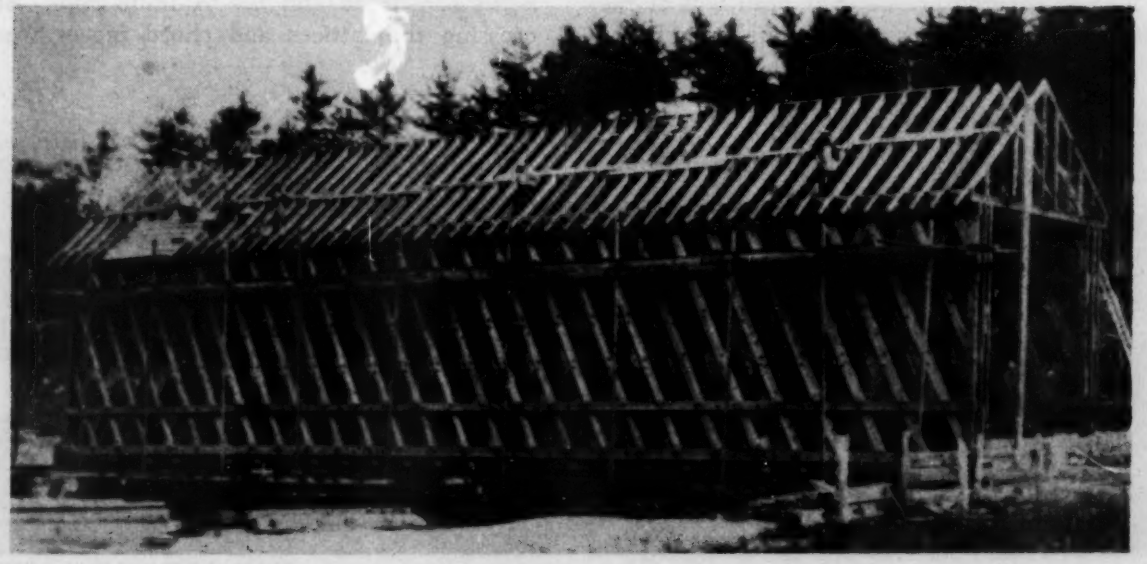
E. H. Royce

SMALL LATTICE BRIDGE WITH LONG OVERHANG AT PORTALS WAS BUILT IN PITTSFORD, VT., IN 1849.

Other Early Designs

Other prominent early bridge builders carried on the idea of arched wooden bridges, but got away from Palmer's insistence on curved lower chords. Theodore Burr (1771-1822), of Torringford, Connecticut, a self-taught millwright, built several experimental spans, including an all-wooden suspension bridge at Schenectady, N. Y., and a pioneer laminated arch truss bridge at Trenton, N. J. He then designed and built long, flat arch trusses, with kingpost bracing, supporting a level roadway.

The first of these was built by Burr across the Hudson River at Waterford, New York, in 1804. It



EARLY PHOTO SHOWS CARPENTERS BUILDING LATTICE BRIDGE FOR BOSTON & MAINE R.R. IN 1880'S.

XUM

E. H. Royce

THIS RAILROAD BRIDGE AT SWANTON, VT. USED A DOUBLE LATTICE WEB FIXED WITH WOODEN PEGS.

consisted of four arch spans, one of 154 feet, one of 161 feet, one of 176 feet, and one of 180 feet in the clear. Not covered originally, and built of hewn yellow pine, it stood for 105 years before being destroyed by fire, in 1909. By that time it had served as a prototype for hundreds of covered arch bridges, and its design became known as the "Burr Truss."

The longest covered bridge ever built was of the Burr design. This was across the Susquehanna River between Columbia and Wrightsville, Pennsylvania — 5620-ft long — over a mile of wooden trusses.

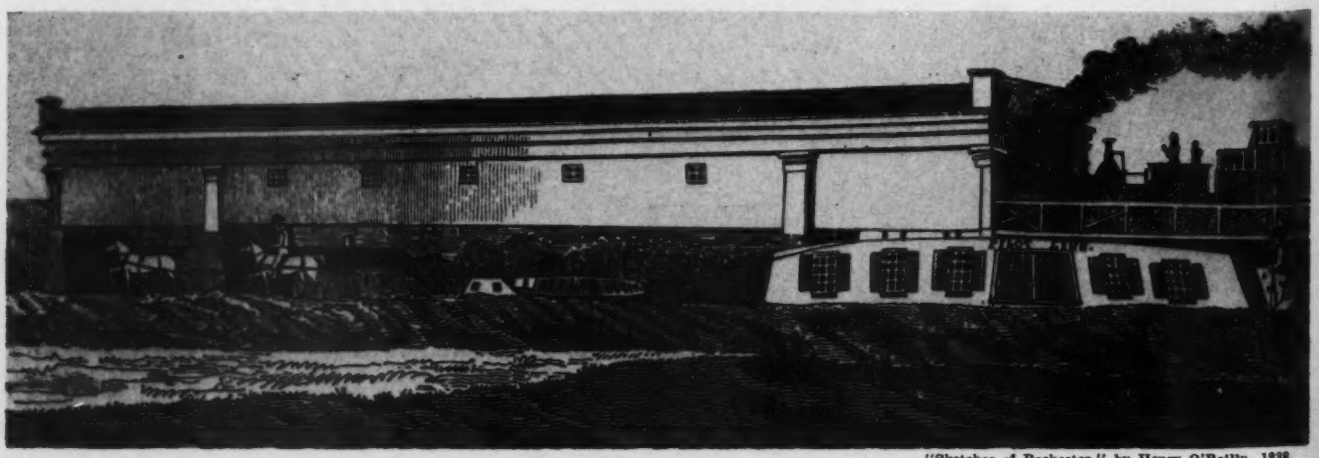
Burr himself superintended the construction of the longest single-span wooden arch bridge ever built. This was at McCall's Ferry, Pennsylvania, where the Susquehanna ran 150-ft deep. Completed in 1815, this bridge had a clear span of 360 feet, 4 inches. Today, prefabricated, laminated wooden arches are used in the erection of huge airplane hangars and public arenas. Though often reported as the "longest," even these have not yet equalled the length of Theodore Burr's little-known arch bridge of nearly 150 years ago.

Though Burr died in 1822, the patented arch truss that bears his name lived on. His boss-carpenters became bridge builders themselves, and made the Burr Truss practically a standard of construction in Pennsylvania. The best Burr bridges still stand in that State and in southern Indiana, where the Kennedy family, of Rushville, built them after 1880. The Hays Bridge, near Carlisle, Pennsylvania, a Burr Truss single span of 110 feet, built across Conondoguinet Creek, in 1825, is thought to be the oldest covered bridge now standing in the U.S.

The Town Lattice Truss

Fine as the Burr bridges were, they needed large timbers and much manpower to erect them. A bridge that could be built by the ordinary carpenter was needed, using common plank that could be cut at the neighborhood sawmill. To answer this need came an invention, in 1820, by Ithiel Town (1784-1844), a Connecticut church architect — the "Town Lattice Truss," a truly American invention, and the first step toward modern framed bridges.

Mr. Town's truss had the look of a latticed garden trellis cut to size to fit across a river. The chords of this bridge were parallel, usually in two sets, spaced so that the web members of latticework would pass between them. The lattices were plank, 2- to 4-in. thick and 10- to 12-in. wide. At every crossing the lattices and chord pieces were fast-



"Sketches of Rochester," by Henry O'Reilly, 1838

FANCY COVERED BRIDGE (1836) OVER THE ERIE CANAL SERVED THE TONNEWANTA R.R. FOR OVER FOURTEEN YEARS.

Alice Durant

SEVEN SPAN, 1282-FT BRIDGE AT HARTLAND, NEW BRUNSWICK, IS LONGEST COVERED BRIDGE STANDING.

SHORTEST COVERED BRIDGE IN U.S. IS THIS 16-FT QUEENPOST TRUSS BUILT IN 1952, IN HAVERTOWN, PA.

ened with two or more long wooden pegs or treenails (pronounced "trunnels") 2 inches in diameter and 6- to 24-in. long. The only iron used in this type of covered bridge was in the nails which attached the shingles and siding.

Ithiel Town was a good businessman. Builders who wanted to put up a lattice bridge using "Town's mode," as he called it, had to pay the inventor a royalty of $1 a foot. Should one of Town's far-flung agents throughout the country find a lattice bridge already erected without payment of royalty, the charge was doubled.

Prefabrication

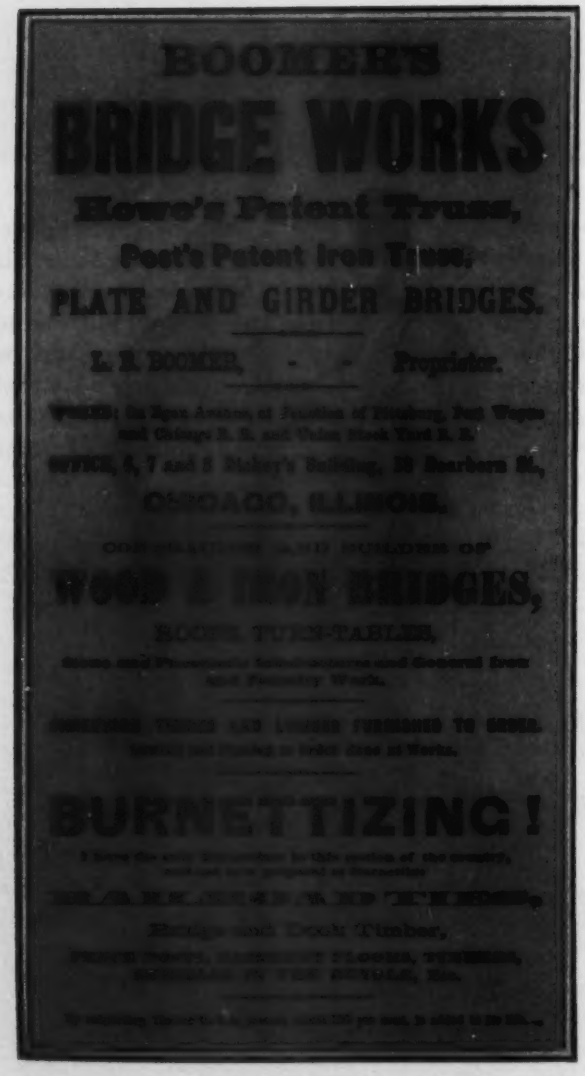
Lattice bridges usually were built a whole side truss at a time in a field adjacent to the bridge site — prefabricated, one might say. Carpenters bored holes in the plank with hand-operated boring machines. After fitting, the lattices were pinned tight with the treenails, which previously had been boiled in linseed oil. When everything was ready, the truss was moved slowly out on rollers over falsework in the river, using horse and manpower. Next it was raised in place by rope rigging or small derrick. When both trusses were erect, the two were jointed by upper and lower bracing. With a floor laid, weatherboarding and roof completed the boxed-in lattice bridge. Some builders gave them a little upward camber so that when the weight settled on the pins, the bridge floor would come exactly level.

The Town Lattice Truss was a favorite in the East, and nearly 100 are still standing in the New England States. Across the country are other "islands" where bridges of this design caught on. Examples still exist in Indiana County, Pennsylvania; Ashtabula County, Ohio; Madison County, Iowa; and an area extending from Mississippi across

Ladislav Dejnoska

DETAILS OF TYPICAL COVERED BRIDGE JOINT FROM A LONG TRUSS BRIDGE BUILT AT HAWLEY'S, N.Y.

UNCOVERED SIDES AND TOP PERMIT GOOD VIEW OF THE STRUCTURAL DETAILS OF THIS ALBANY, N.Y. BRIDGE.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BRIDGE WORKS
Howe's Patent Truss,
Post's Patent Iron Truss;
PLATE AND GIRDER BRIDGES.
L. B. BOOMER, - - Proprietor.
CHICAGO, ILLINOIS.
WOOD & IRON BRIDGES,
BURNETTIZING!

BROADSIDE OF 1870 ADVERTISES SERVICES AND PRODUCTS OF EARLY CHICAGO BRIDGE BUILDER.

northern Alabama and Georgia. At Horseshoe Bend, near Dadeville, Alabama, is the longest covered bridge still standing in the United States, a 600-ft Town Lattice bridge across the Tallapoosa River.

Common sense dictated the design of bridges in early America. During this "broad-ax and chisel period," a bridge foreman was asked how he determined the size of his timbers. He simply replied, "Well, I take the average judgment and guess and allow." Such rule of thumb was common procedure.

Engineering Design

In 1830, Colonel Stephen H. Long (1784-1864), of the United States Army Topographical Engineers, devised the first wooden truss in America based on engineering calculation. This was an all-wood boxed frame truss, with tension members and braces in pairs, and single counterbraces. It was put together with an intricate system of wooden keys and wedges, which made it difficult to erect. Nevertheless, it enjoyed a 10-year popularity, and with the infant railroad industry in need of bridges, the Long Truss was a bridge that can claim many "firsts."

The first railroad grade crossing separation in America was on the Long plan — a bridge to carry the Washington Turnpike over the Baltimore & Ohio Railroad outside of Baltimore. Then there were the first railroad drawbridges, over the Passaic and Hackensack Rivers in New Jersey, and the first combined railroad and highway bridge, over the Raritan River at New Brunswick, New Jersey — with highway in the dark interior, and the railroad rumbling across the top.

Only a few Long Trusses stand today. There are isolated examples near Sangerville, Maine; Browns-

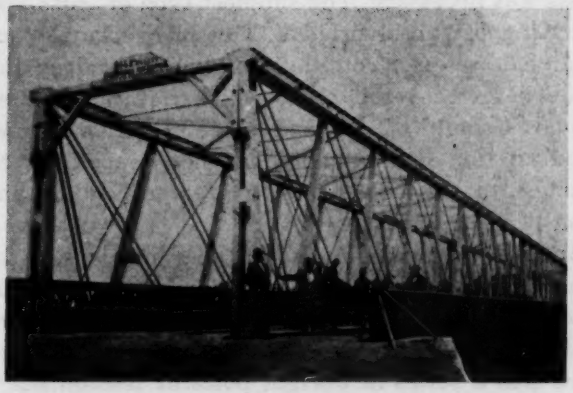
ville, Indiana; Troy, Ohio; two in Delaware County, New York; and several in Colonel Long's home state of New Hampshire.

The Famous Howe Truss

Long Trusses and Town Lattices vied for supremacy on the little pioneer railroads of the 1830's. But after 10 years both were nearly totally eclipsed by a new bridge invention — the Howe Truss, whose name still has a familiar ring to older engineers. This was the patent design of a Spencer, Massachusetts carpenter-contractor named William Howe (1803-1852), uncle of Elias Howe of sewing machine fame. Admittedly, he based his invention on the old Long Truss, a boxed frame bridge with wooden top and bottom chords and wooden braces. There was one important difference. In place of the upright timbers, Howe substituted iron tension rods in pairs and special blocks at the intersections against which the braces and counterbraces could be held in compression. The difficulty of adjustment which plagued the Long Truss was eliminated by Howe's system of iron rods, which could be trued by tightening bolts or twisting turnbuckles.

The Howe Truss Patent, of 1840, marked the transition between wooden bridges and those of iron. Invented at just the right time, it was the bridge built by most of the railroads for 30 years. The pieces for a Howe Truss bridge all could be precut and shipped directly to the bridge site on a pair of flatcars. Sometimes they were hauled in wagons to the locations, and stood ready for the rails before the roadbed was graded.

William Howe made bridge building a big business. Companies formed by him and by his relatives, the Stone family, of Charlton, Massachusetts, built



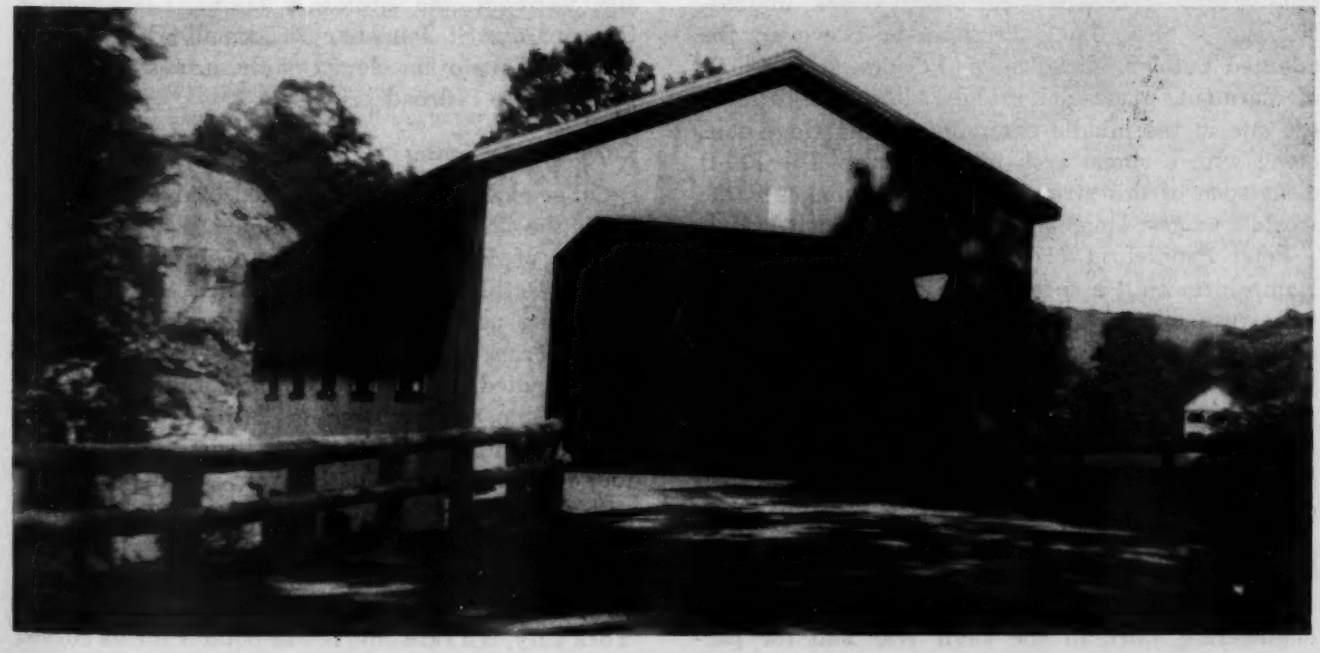
A RARE DESIGN OF WOOD AND IRON INVENTED ABOUT 1867, BY S. S. POST OF JERSEY CITY, N.J.

railroad and highway bridges across the continent. In the 1850's there was enough work for them out of St. Louis to buy a whole wooded township in Missouri, just for bridge timbers.

Because of the far-flung operations of these companies, a Howe Truss bridge or two can be found in nearly every state that has covered bridges. Many still stand on the highways of southern Ohio and Indiana. The Milwaukee and Southern Pacific Railroads maintain a dozen of them on branch lines in Washington and Oregon. A 300-ft covered Howe Truss bridge at Park Junction, Washington, was built as recently as 1938.

Simple Designs

Patented designs like those of Burr, Town, Long, and Howe dominated the field of covered bridge building as far as the larger rivers were concerned.



A MODERN COVERED BRIDGE ERECTED IN 1951 UNDER DIRECTION OF THE MASSACHUSETTS DEPT. OF PUBLIC WORKS.

But for the numerous small streams, only a simple truss was necessary. The simplest type of truss was the Kingpost, an inverted V. This plain triangle was used as a base for countless uncovered bridges and quite a few covered ones, which naturally lasted longer. Usually all of wood, some of the later ones used an iron rod extending from the apex of the triangle to the base, to give greater rigidity and ease of adjustment.

Inevitably developing out of the Kingpost was the Queenpost Truss, with a timber across the top of the inverted V to allow for a longer length of bridge. A logical next step was a Multiple Kingpost Truss. This was a series of upright posts or tension members, with braces all inclined from the abutments to the center or Kingpost.

Any capable carpenter could put up either King- or Queenpost bridges in a hurry. The same principle was used every day in the roofs of houses and barns. Many of these little bridges still carry light traffic on the back roads of Vermont, New Hampshire, Pennsylvania, and Ohio. Thought to be the shortest covered bridge in the United States (and one of the newest) is a little Queenpost Truss only 16-ft long. This was built in 1952, at Havertown, Pennsylvania, to serve a sawmill. Robert Smith, the mill owner, built it himself, spending only $850 for materials. He said he was tired of having open plank bridges rot away.

One-of-a-Kind Designs

There were many odd, one-of-a-kind bridge trusses. Ingenious carpenters would take features of a patented type and, perhaps not wishing to pay royalties, combine them with designs of their own. An outstanding example is the big Blenheim Bridge, still standing at North Blenheim, New York. This unique span, built across Schoharie Creek, in 1854-55, uses a basic Long Truss plan. However, the talented builder, Nicholas M. Powers (1817-1897), of Vermont, made the bridge with three trusses, the one in the middle extending to the ridge-pole, along with a single arch in the center. The 210-ft clear span of this structure currently makes it the world's longest single-span covered wooden bridge.

Peter Paddleford (1785-1859), of Littleton, New Hampshire, built a special type of all-wood framed box truss all over northern New England which also was based on Long's patent. This one used continuous braces and counterbraces to stiffen the truss, and give the ends an overhang to combat rot at the bridge seats. Examples of it can be found today at Conway, New Hampshire; Porter, Maine; and Lyndonville, Vermont.

Haupt's Designs

Herman Haupt (1817-1905), famed for railway engineering work in the Civil War and for participation in the building of the Hoosac Tunnel, was another bridge truss designer. Haupt experimented incessantly with models, and finally patented one, in 1839. It was essentially a lattice bridge in which lattices were slanted toward a kingpost in the center and further aided by an auxiliary arch or queenpost. Haupt was endeavoring to combine three or four trusses in one design. With the popularity of the Howe Truss, which appeared the following year, the Haupt design never caught on, though an occasional one was built by readers of Haupt's books on bridge building. Only two are known to exist today, a little span near Claremont, North Carolina, and a larger one at Thetford Center, Vermont.

The Pratt Truss

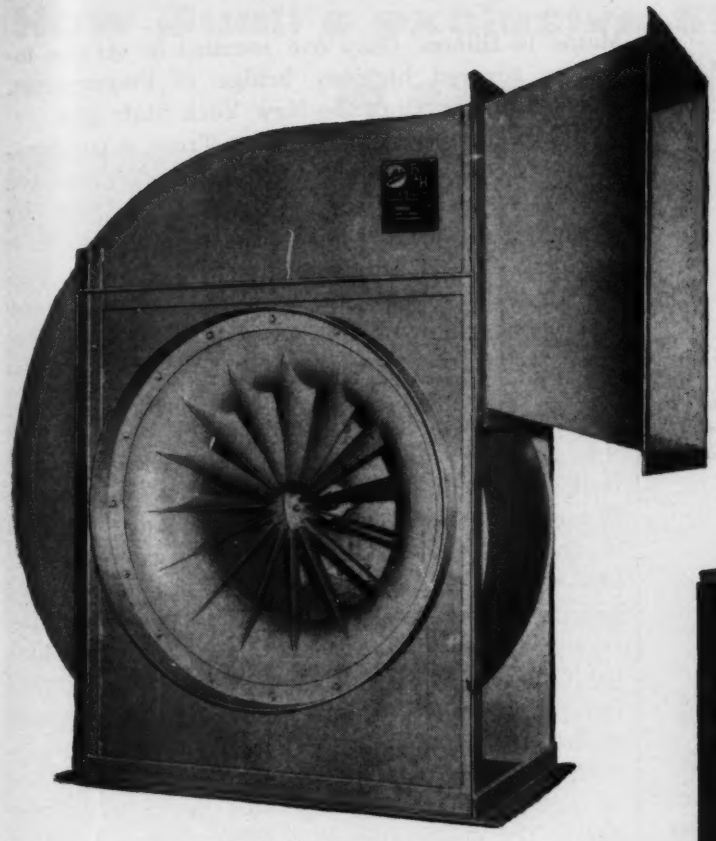
Another name which may have a familiar ring is the "Pratt Truss." First patented, in 1844, by T. Willis Pratt (1812-75), a Boston railway engineer, it is the exact opposite of the Howe Truss. In the Pratt design the upright posts or tension members are of wood and the compression members are composed of iron rods. John Roebling used it for the roadway of his suspension bridge over Niagara, in 1855. This bridge proved hard to adjust to moving loads when built with wood, but as an all-iron bridge it became popular with the railroads after the Civil War. An adaptation of Pratt's wooden design is found in the Lincoln bridge, a covered span built in 1865, over the Ottauquechee River, near West Woodstock, Vermont. This is the only known existing use of Pratt's principle in wood now standing in the United States.

In his later years, Willis Pratt redesigned the Old Town Lattice bridge truss for use by New England railroads. To support heavier engines and rolling stock, these used double and triple lattice webs built around long laminated arches. In New Hampshire and Vermont, the Boston & Maine, Claremont & Concord, and St. Johnsbury & Lamoille County Railroads still maintain eleven of these massive Town-Pratt lattice railroad bridges.

Other Special Trusses

Other examples of odd covered bridge trusses include the Childs design, patented in 1846, by Horace Childs, of Henniker, New Hampshire, but found only in Preble County, Ohio; and the "Smith Truss," a bracing arrangement of wooden timbers in the Howe Truss manner but without iron rods. This was patented, in 1867, by Robert W. Smith, of Tippecanoe, Ohio, and built by his Toledo firm, the Smith Bridge Company. Some Smith trusses still can be found in Ohio and Wabash County, Indiana, as well as in Oregon, where a patent grantee, A. S. Miller, built a great many.

The "McCallum Inflexible Truss," patented in 1851, by Daniel C. McCallum (1815-78), of New York City, is a rare one. It was notable for its curved upper chord, and was built for many railroads from



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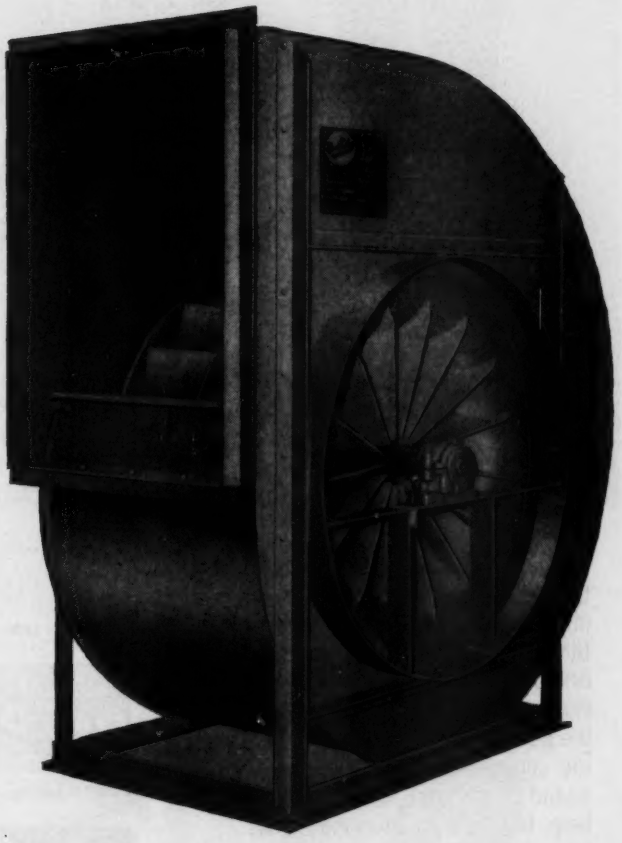

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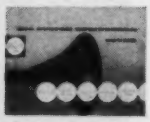

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Maine to Illinois. Only one remains in service today, a covered highway bridge at Powerscourt, Quebec, just north of the New York State line.

Still another rarity is the Post Truss, a combination of wooden chords and kingposts, with iron rod cross-bracing, which was invented in 1865 by Simeon S. Post (1805-1872), of Jersey City, N. J. Only one covered bridge on this plan still stands in the United States — the Bell's Ford Bridge, over the East Fork of White River, northwest of Seymour, Indiana.

Modern Covered Bridges

In only two areas has the building of covered bridges continued to the present day. In Western Oregon, notably Lane County, modern covered bridges are occasionally built. One near Cottage Grove, Oregon, built in 1950, replaced an old steel bridge. Timber is plentiful in this region, and the county highway department uses a standard plan for building covered bridges. They have adapted the old Howe Truss, with no counterbraces except in the center panels of the longer bridges.

On the other side of the continent, the Province of Quebec still builds a covered bridge every few years. The Department of Colonization is responsible for opening up new areas of the province, and its work includes the buildings of roads and bridges to reach these districts. Colonization Bridges, as they are called in Quebec, use the old Town Lattice plan of construction. They usually are built on earth crib abutments, have extra frame bracing inside, and instead of the old wooden treenails, the intersections of the lattices are each fastened with four large spikes.

In the neighboring province of New Brunswick, covered bridge builders have favored the Howe Truss. At Hartland, N. B., there is one of these, 1282-ft long in seven spans, stretching across the St. John River to make the longest existing covered bridge in the world.

Sentimentalists

In recent years, sentimental townspeople in New Hampshire and Massachusetts prevailed upon highway departments to replace three old covered bridges in kind. As a result there are three new covered spans, basically alike, between Hancock and Greenfield, N. H., and at Charlemont and Sheffield, Mass. The last was dedicated in 1953.

These modern covered bridges are built on an unnamed truss plan of heavy diagonal compression members arranged in cross-braced form with smaller timber tension members. Chords are built-up laminated beams, and the connections are made by patented Teco connectors. Though old-timers found it hard to believe, there was just no timber left in New England to meet the specifications, and these bridges were built of West Coast fir! ▲▲

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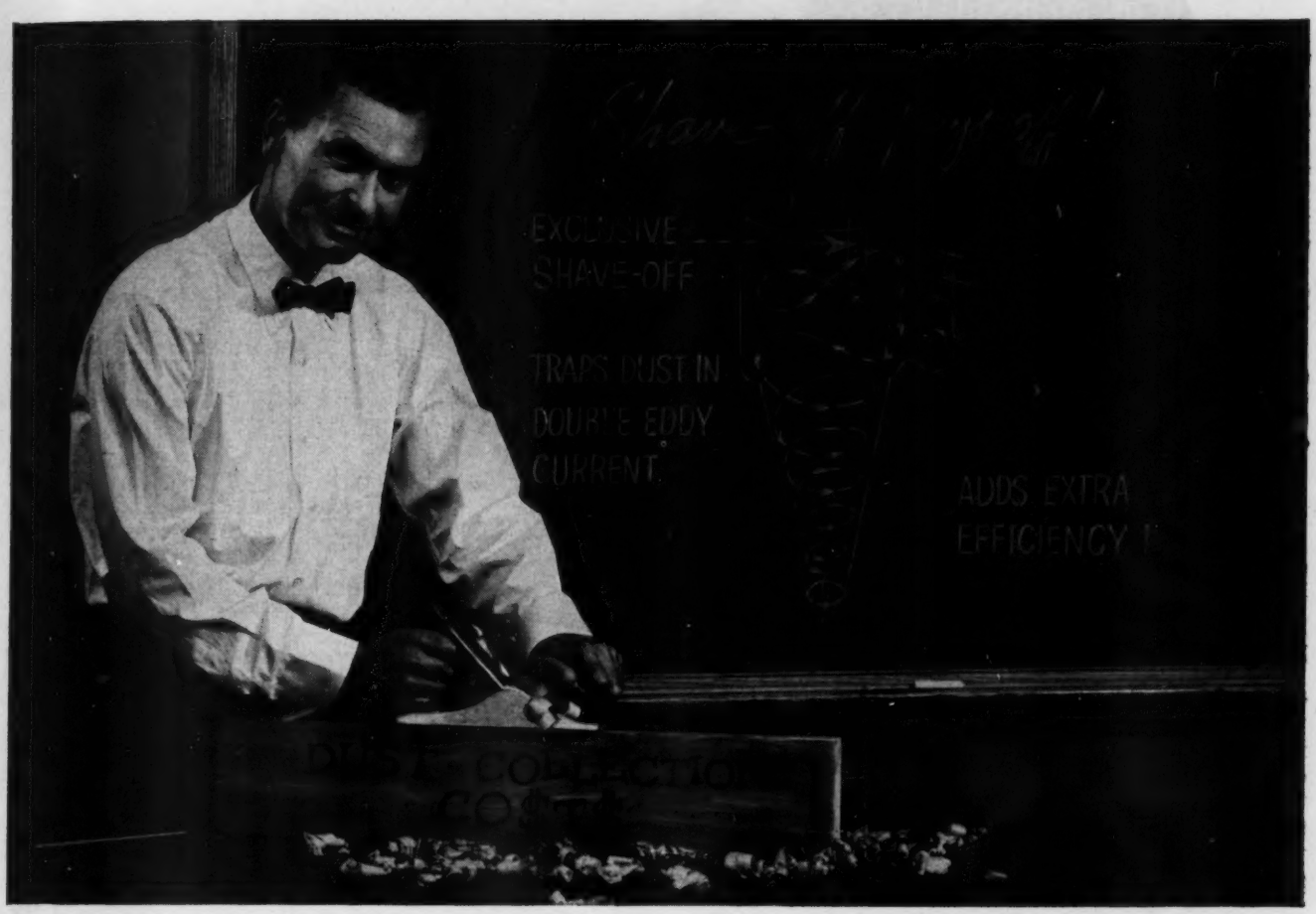

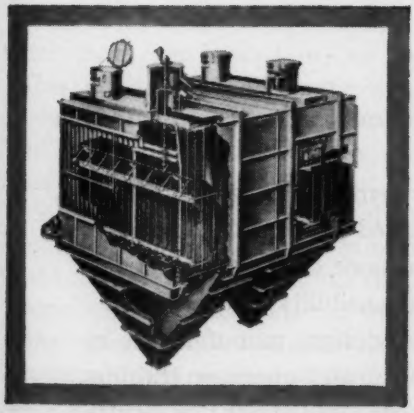

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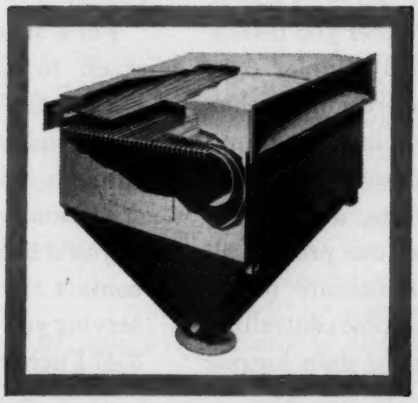

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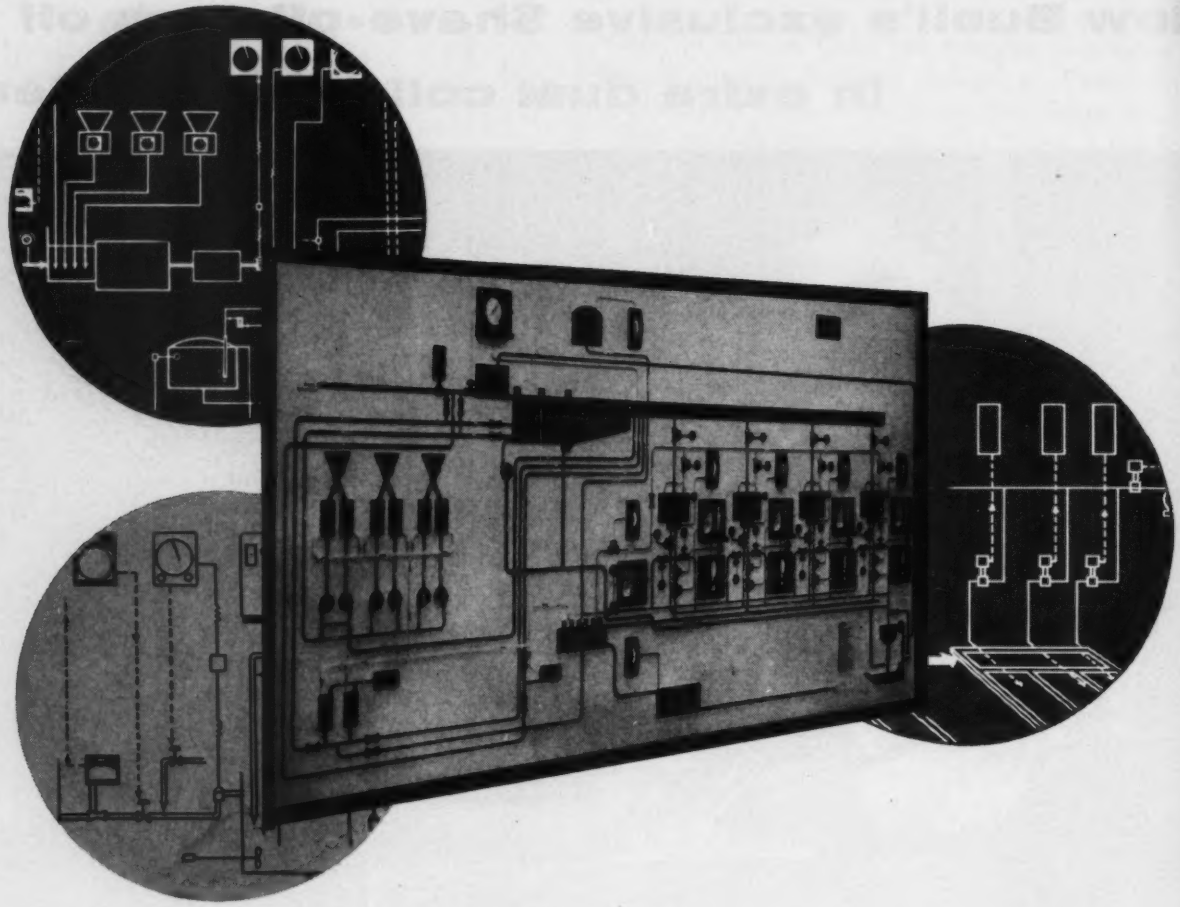

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AMONG THE LAWS of Babylon, over four thousand years ago, was a statute, "If a man steal ox or sheep, ass or pig, or boat — if it be from a temple or palace, he shall restore it thirty-fold; if it be from a freeman, he shall render ten-fold." A thousand years later there was stated in the Hebrew Decalogue, "Thou shalt not steal." In the early years of the last century, the poet Byron wrote, "Kill a man's family and he may brook it, but keep your hands out of his breeches' pocket."

Since the times of Hammurabi, however, the protection of the "ox or sheep" from theft has expanded until it now embraces thoughts as well as things. Plans and specifications of engineers, relating to either mechanical, electrical, or civil devices, are protected from piracy and theft by substantially the same rules of law that protect any private property.

Common Law Protection

Of this protection against exploitation by others, the Federal court once had this to say about engineers plans that had not been copyrighted:

"The conceptions which it represents are as free as the birds of the air or wild beasts of the forests, but they belong to him who first reduces them to captivity. The common law protection continues only so long as the captives or creations are kept in confinement or controlled. The author of a work of art has at common law a property therein until it is published with his consent. He may withhold or communicate it, and in communicating it he may impose such restrictions upon its use as he sees fit."

This principle of law applies to any expression of ideas whether it be the work of an engineer, an author, artist, architect, or any other creative worker.

Joseph Story, associate justice of the Supreme Court in the days of John Marshall, stated, "In cases of literary, scientific, and professional treatises in manuscript, it is obvious that the author must be deemed to possess the original ownership and be entitled to appropriate them to such uses as he shall please. Nor can he be justly deemed to intend to part with that ownership by depositing them in the possession of a third person or by allowing a third person to take and hold a copy of them. Such acts must be deemed strictly limited, in point of right, use, and effect, to the very occasions expressed or implied, and ought not to be considered for any purposes of profit or publication to which the receiver may choose to devote them."[1]

In lay language this would seem to mean that the courts agree that plans prepared by an engineer are his own property to do with as he sees fit. Even if they are not copyrighted, he can pass them along to a third person to hold for him, and that person has no legal right to do anything more with them than the owner specifically intended.

For example, drawings and specifications for what he claimed were improvements for dial telephones

were submitted by an engineer to a telephone company under an agreement that should the company adopt the improvements described in the plans, the engineer would be given employment within the company. Later, the company refused to accept the inventor's offer and returned the plans and drawings. The inventor claimed that in the time the plans were in the possession of the telephone company, his ideas for the improvements had been adopted and used in violation of the agreement under which the plans had been submitted by him. He brought a suit against the company.

In the decision, the court said, "This man did not patent his invention, and the general statement has sometimes been made that an inventor's right to his unpatented work depends on his ability to guard successfully his secret... But when the idea comes into the possession of one through special confidential disclosure by the inventor or under contractual or other legal restrictions, its disclosure may be the breach of a fiduciary trust which equity will restrain. And if there is a profitable use made of it, the fiduciary nature of the knowledge acquired may result either in a requirement to account for damages for the invasion of the property right against one who has thus acquired the knowledge and misused the confidence."[2]

Disclosing is Not Publication

We see then that it is permissible for an engineer to show uncopyrighted plans to anyone he chooses and that those persons may not make use of them without his permission. Passing along plans with restrictions attached does not in any way constitute a publication, and the engineer may safely disclose his plans to others without "giving away his secret."

Another example of this principle is illustrated in a case reviewed recently by the U.S. Court of Appeals. Here an action was brought by an engineer for appropriation of plans he had conceived and developed for freight containers. Negotiations for the sale of these plans for a fixed sum and royalties were suddenly abandoned by the prospective purchaser, yet manufacture of similar containers was begun by that company. Suit for damages was brought by the original designer.

In its decision in favor of the engineer, the federal appellate court said, "Confidential business information is not given protection merely as an award to its accumulator. If the creator is entitled to reward it is available to him in the patent and copyright statutes. Instead, our function is that of condemning the employment of improper means to procure trade secrets. Those who gain their information improperly are brought to book in recognition of the general principle that intentionally inflicted harm is actionable unless privileged.

"It is unquestionably lawful for a person to gain possession through proper means of his competitor's product and through inspection and analysis create a duplicate unless, of course, the item is patented. But the mere fact that such acquisition is available does not mean that he may, through breach of confidence, gain the information in usable form and escape the efforts of inspection and analysis. The fact that a trade secret is of such a nature that it can be discovered by experimentation or other fair and lawful means, does not deprive its owner of the right to protection from those who would secure possession of it by unfair means."[3]

In other words, if a consulting engineer's plans are pirated by unfair means, he has recourse to the law even though his plans are not patented.

The Designer is Protected

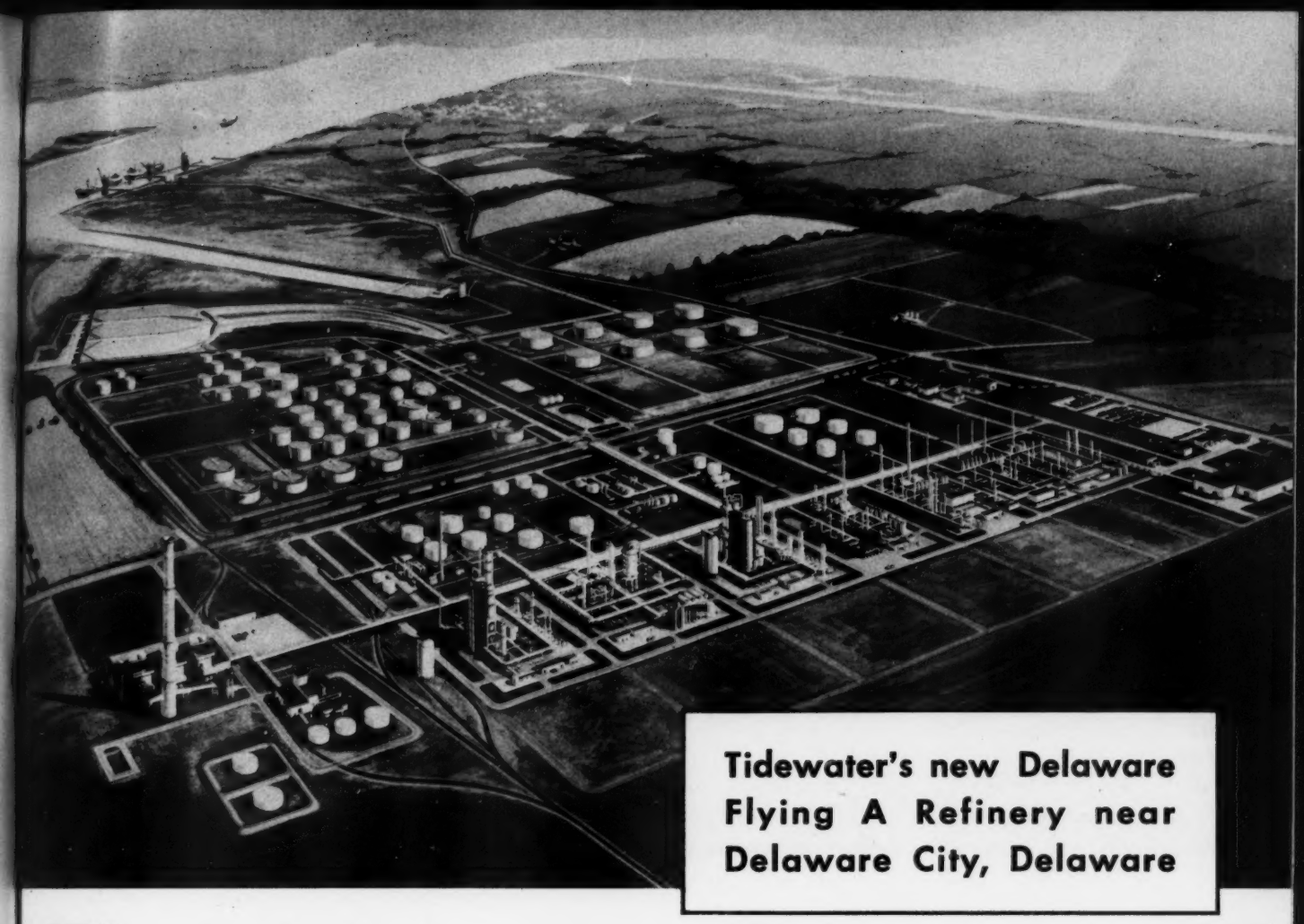
This point is again illustrated in a case before the New York Court of Appeals more than 60 years ago. A rotary pump had been designed, and while the pump itself had been sold without restrictions, the designer had kept secret the patterns necessary for its manufacture. When later these patterns were entrusted in confidence to a pattern maker for repair, the pattern maker violated the confidence imposed in him, made duplicate patterns, and undertook the manufacture of these pumps.

The court decided in favor of the original pump designer stating that the size and shape of the patterns were a secret which the inventor had not published and in which he still had exclusive property. They went on to say that simply because a discovery may be made by a fair means, this does not justify a discovery by unfair means, such as were employed in this instance, or by the bribery of a clerk or some other such method. The court further stated that even if the pump could have been designed without the patterns and the use of the patterns was more of a convenience than a necessity, still, there was a secret, and this belonged to the original designer. The pattern maker had no right to obtain it by unfair means. If the secrets involved in the patterns had not been published in any way, they belonged to the owner and remained his exclusive property unless they were discovered in some fair means.

Limited Publication

Courts also have decided that even limited publication does not constitute the release of secret designs for public use. Some years ago it had been the practice of a manufacturer of railroad cars to furnish customers with drawings and blueprints of the cars and their various parts to facilitate the preparation of orders for repairs. In one instance these prints had been appropriated and used by a competitor in the manufacture of similar products. The original manufacturer brought suit in the Pennsylvania Supreme Court. The court stated:

"That the company had an exclusive property in the drawings in its offices and no one, whether drafts-



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Unique electrical distribution system provides outstanding power continuity

Tidewater Oil Company's new 130,000-barrel-per-day Delaware Flying A Refinery in Delaware, designed and constructed by C. F. Braun & Co., is of special interest because of the high degree of dependence placed on the electrical distribution system. This is especially significant since it is the world's most modern refinery, with the largest initial capacity of any refinery yet built.

With continuity of power a "must"—for even a power failure of a few seconds cannot be tolerated—the problem was to work out systems and components which would set a new high in continuity of operation.

In doing this, certain motors were modified for 250% breakdown torque at normal voltage to meet the special requirements for re-acceleration after a fault. It was then necessary to design the control with low drop-out characteristics.

This meant the closest type of relationship was required between all the Allis-Chalmers engineering departments concerned, and C. F. Braun & Co., prime contractors for the tremendous project.

As on other complex jobs, group effort was used to provide coordination between departments, and to take advantage of the variety of experience in each department. Conference phone calls were used to handle matters of delivery and design modifications that came up during construction. In this way, problems could be considered quickly and decisions made immediately.

A network analyzer was used extensively to study the effect on the system of the worst possible faults, thus saving months and months of calculations.

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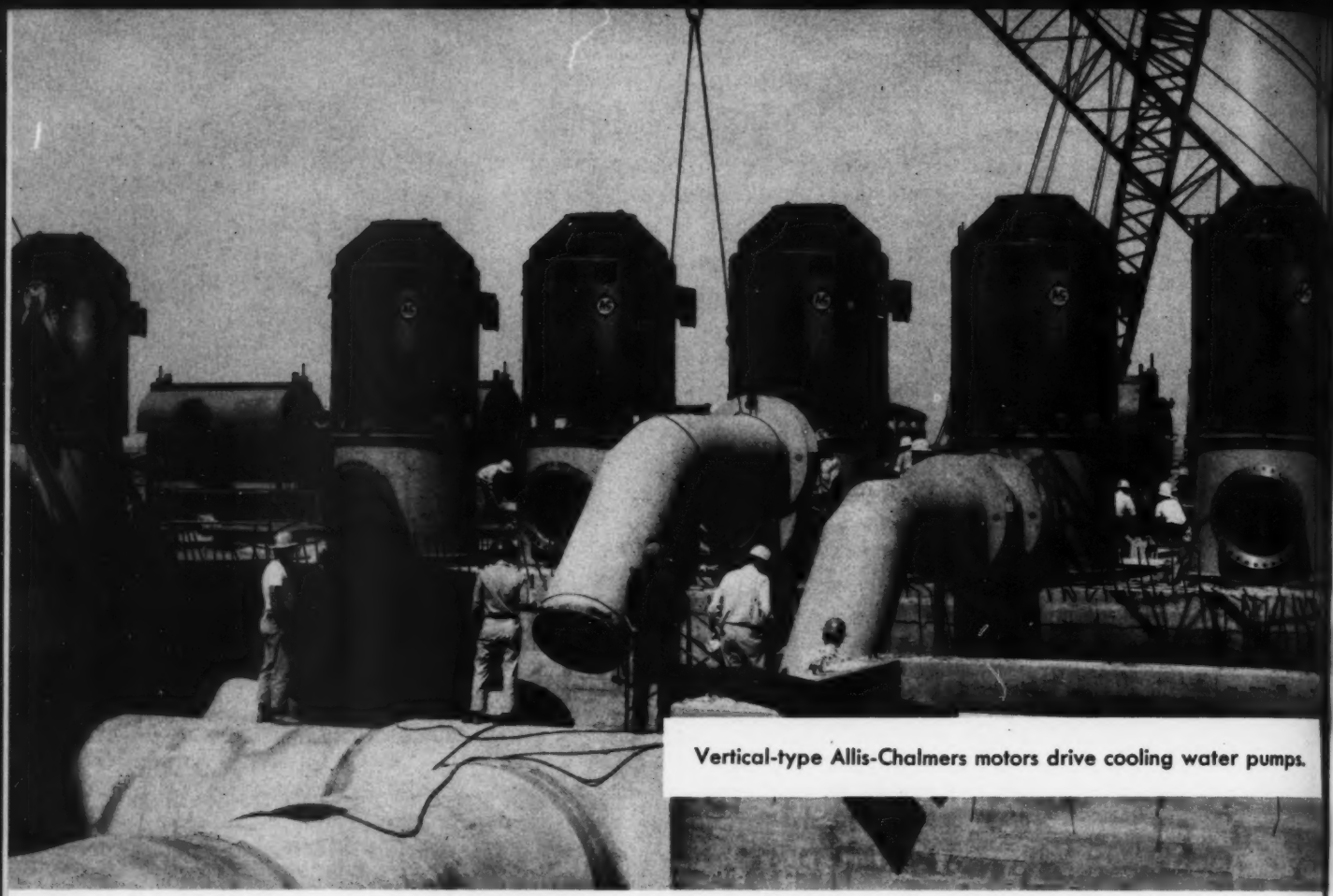
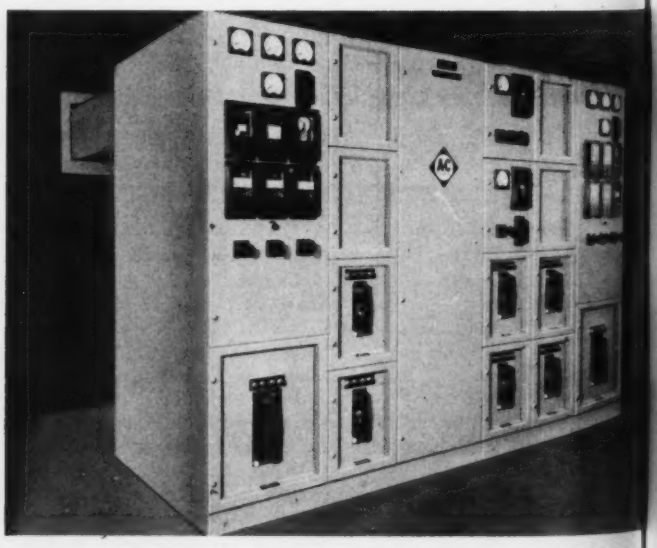


Vertical-type Allis-Chalmers motors drive cooling water pumps.

Electricity at work throughout

A few of the 300 Allis-Chalmers motors used for driving pumps, compressors and other equipment. Motors in foreground feature tube-type, air-to-air heat exchanger.



Allis-Chalmers new low voltage switchgear incorporates selective trip, an absolute requirement on the job, in addition to its many other features.

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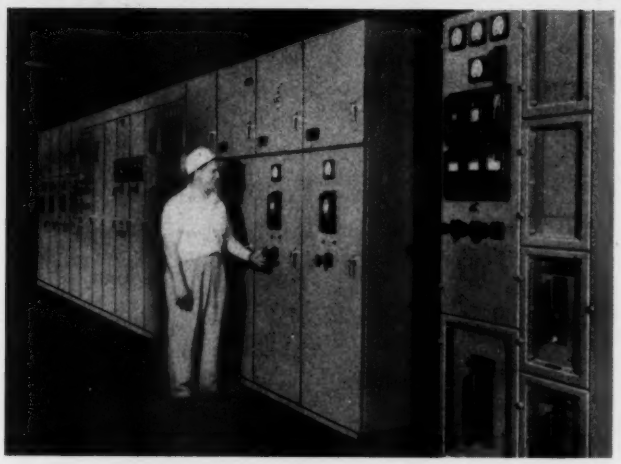
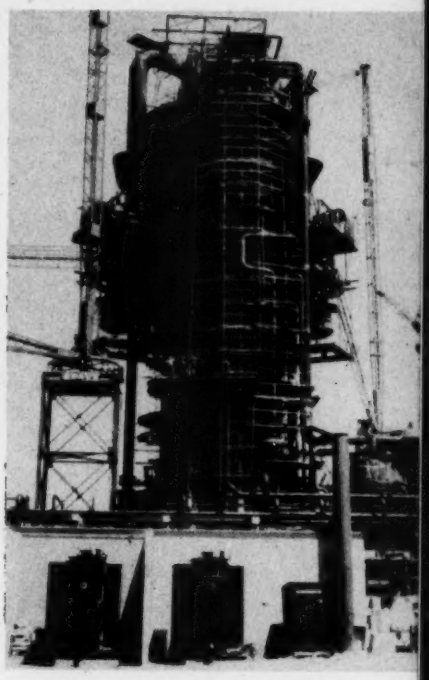


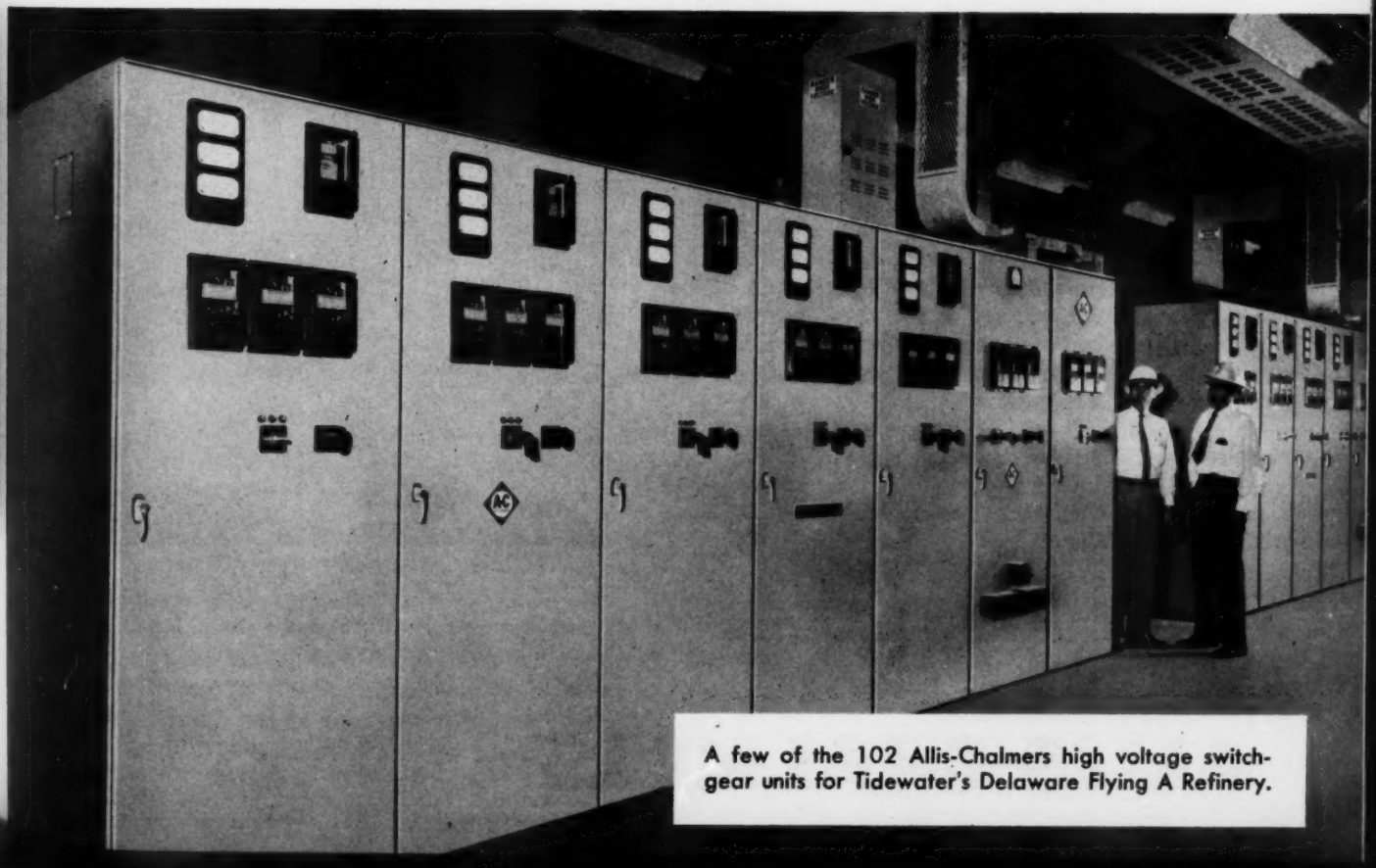
All the motor control and switchgear are located inside switch houses. These buildings are pressurized to exclude explosion vapors. Bus duct systems are pressurized.

Teamwork! A part of the Allis-Chalmers coordinating team is shown during one of frequent meetings.



All transformers are oil-insulated, sealed-tank construction with welded-on tubular radiators. They are equipped with high voltage disconnecting switches, capable of breaking magnetizing current. Fan motors are explosion-proof.

Tidewater's New Refinery



A few of the 102 Allis-Chalmers high voltage switchgear units for Tidewater's Delaware Flying A Refinery.

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More than 125 high voltage motor controllers are used at the new Delaware Flying A Refinery.

Motor Control is one of the Key Factors in assuring Power Continuity

To permit motors to remain on the line through severe system voltage disturbances, important design developments were made in both the 2300-volt motor control circuits and main motor starting contactors.

The magnetic circuit of the high voltage air contactor was redesigned so that it would remain closed, even though magnetically held, for a period of 19 cycles after complete loss of power. In addition, the magnetic circuit remains sealed even when the voltage drops to 35% of normal.

Get details! These developments are important wherever continuity of operation is vital. Allis-Chalmers engineers can help you. Call your nearby A-C office or write Allis-Chalmers, Power Equipment Division, Milwaukee 1, Wisconsin.

Two separate studies were made using a network analyzer. Teams from Allis-Chalmers and C. F. Braun & Co. worked together to assure power continuity.

ALLIS-CHALMERS

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man or other employee, had any right to have blueprints made for his own use or the use of others, is clear. It matters not that the parts of the cars were not protected by patents and that the process of manufacture was not a secret one.

"A certain amount of publicity is unavoidable in any manufacture, but an unlocked door is not an invitation to the passerby or to the servant of the household to help himself. Neither does a manufacturer abandon his property in a design by delivering it or a copy to another for a restricted purpose nor by a limited publication.

"So the exhibition of a blueprint of machinery in a frame in the office of the purchaser, although done by permission of the manufacturer, a copy of whose drawing it is, certainly is not a general publication and an abandonment of exclusive rights in the drawing."[4]

What is Publication

It will be noted that all of these cases involve the question of publication. Where the engineer has not published his plans, the courts have tried to protect him even when there was some limited publication. Courts also have recognized that discussion of plans and specifications with associates or with those by whom he is employed does not constitute publication. The Supreme Court of the United States has said, "It is a fundamental rule that to constitute publication there must be such a dissemination of the work . . . itself among the public as to justify the belief that it took place with the intention of rendering such work common property."[5]

This would seem to put the engineer in a protected position so far as uncopyrighted plans are concerned except for one thing. An engineer who designs buildings or structures usually is required to file building plans with a municipal officer. Generally speaking, the courts have decided that this constitutes publication, and anyone, therefore, may make use of the plans thereafter, providing they have not been copyrighted. For example, plans and specifications prepared for the construction of a building were filed in the building department of a city. Later, when another building was constructed by others who used these same plans, suit was brought by the first engineer to recover the value of these plans from the user on the ground that the ideas were the property of their originator or author.

The court decided that while it was true that so long as the plans remained in the possession of an engineer they constituted personal property and no one had the right to take them from him or make use of them without his consent, the filing of the building plans constituted publication to the world, leaving the engineer no longer any exclusive right in the design or its reproduction. The court went on to say "This would seem to be especially true where the plans and specifications have been used in the construction of a building, and the building has been exposed to the view of the public and has afforded the engineer the full value of his services."[6]

Los Angeles is Different

This decision would seem to be typical of other past decisions and those that might be expected in the future. However, a law suit recently came up for a decision before the Supreme Court for Los Angeles County in California that provided quite a different decision. In this instance a structural engineer brought suit for the appropriation of plans he had prepared for a nine-unit apartment house. These plans had been loaned to a builder by the engineer for consideration in connection with negotiations for supervision and design of a project. While the plans were in the possession of the builder, he had copies made which later were used in the construction of the buildings and no agreement was made with the structural engineer for the use of the plans.

Here, the jury returned a verdict for the engineer, awarding him $20,000 compensatory and $30,000 punitive damages. The difference in this case was that under the building code of the City of Los Angeles, plans filed for record with the building department are specifically stated not to be public records and they are withheld from inspection just as are patent applications and specifications by the U.S. Patent Office before the issuance of a patent. Loaned in confidence to this builder, the ideas these plans represented remained the property of the engineer, and for the pirating of this confidential information the wrongdoer was held liable in damages.

A Matter of Local Law

Therefore, it is necessary for any engineer to know whether the filing of plans with a particular city or local building department constitutes publication in the eyes of the court. If this is publication, then the engineer no longer has exclusive right to the use of the plans. Anyone may copy them and build a similar structure. But if the plans filed are held in confidence so that the filing does not constitute publication, then the engineer still holds his plans as secret, and the courts will protect him against any unfair pirating of them. Any other engineer or builder could still measure the structure and copy it, but he could not, lawfully, construct from the original designer's plans without his permission. ▲▲

References

1. Werckmeister v. American Lithographic Co., 134 Fed. 321.
2. Petnel v. American Tel. & Tel. Co., 117 N.Y.S.2d 294.
3. Smith v. Dravo Corporation, 203 Fed. 2d 369.
4. Pressed Steel Car Co. v. Standard Steel Car Co., 60 Atl. 4.
5. White v. Kimmell, 94 F. S. 502.
6. Wright v. Eisle, 83 N.Y.S. 887.

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Report from TEL AVIV

VLADIMIR YASSEN

CONSULTING ENGINEER CORRESPONDENT

VISUALIZE a small country, which — since 1948 — has more than doubled its population. Most of the territory is desert, with limited possibilities for irrigation. Even though there are few industrial plants, there is a shortage of power. The government is depended upon to provide housing, undertake construction of an extensive irrigation network, modernize ports, build railways, reclaim swamps and — in the process — provide the country with a sound economic foundation. This is a picture of Israel.

Since the State of Israel was formed, in 1948, the population has catapulted from 600,000 to an estimated 1,600,000.

With the aid of American Jews, private investments from a number of countries, two Export-Import Bank loans, and other resources, the Israeli government has founded towns; constructed an irrigation system based on natural springs, underground lakes, and rivers; and built factories, roads, railways, and hospitals.

In the process of building a country from meager beginnings, the Israeli engineer has gained a position of prominence.

Technical Society

An Israeli Association of Engineers and Architects now has 3000 members, most of whom are employed by the government, municipalities, and large industries. The association, with offices in Tel Aviv, Haifa, Nathania, Jerusalem, Beersheba, and Tiberias, also has among its members an estimated 600 consulting engineers (the Lishkat HaAtsmayim), who are active in all fields of private practice. This concept of an over-all engineering organization with a group within it to deal with the problems of consulting engineers is somewhat similar to the way the National Society of Professional Engineers, in the United States, has functional groups that devote their efforts to the special problems of segments of the profession.

The AEA board grants memberships on a basis of professional qualifications and past work records. The organization has a Code of Ethics, and fees for the engineers in private practice are regulated by a schedule, which is set by the government and based on recommendations of AEA board members.

Unfortunately, there is no engineering registration law in Israel, and because of this legal void dating back to the days of British rule, anyone can — without fear of consequence — open a consulting engineering firm. While only engineers with academic training are entitled to membership in the AEA, many persons with no engineering training have been working for years as draftsmen or assistants in engineers' offices, and some of these have established their own consulting firms. Accurate figures are not available, but it is understood that many of Israel's consulting engineers have no academic or professional qualifications.

In order to correct the rather chaotic engineering picture in Israel, the government and the AEA are preparing a law that will regulate the profession. In order to practice, consulting engineers will be required to have a minimum of 15 years of uninterrupted experience in the office of a qualified consultant, plus a proven professional record. Applicants will be screened by a special committee.

In Israel, the consulting engineer is the chief coordinator and supervisor on a construction project. A contract is negotiated between the engineers' client and the contracting firm but the engineer is strictly the owner's agent; he does not himself engage in contracting for construction.

Frequently, structural engineers and architects operate joint firms, but where they are separate, it has become routine on architectural jobs for structural engineers to be engaged by the architects. But because of a shortage of architects, many structural

Section of Modern Washroom showing Bradley Washfountains and a Bradley 3-stall Shower Unit. (Tile floors and walls by American Olean Tile Co.)

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With foot-control, no time is lost—no water wasted since supply is cut off immediately foot is removed from foot-ring. There are no contaminating faucets to touch—hands, arms and even the torso to the waist, can be washed—each person served fresh clean tempered water from the central sprayhead.

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Bradley precast stone and vitreous enamel models are made in colors to match or harmonize with tile floors or walls—further encouraging neatness.

Bradley *Washfountains* and *Showers* provide economical, super-sanitary washing and bathing facilities for factory men and women, "white collar" employees, and are widely used in schools, institutions and public buildings, too. Catalog 5601 shows complete line with specifications—copy free on request. BRADLEY WASHFOUNTAIN CO., 2339 W. Michigan St., Milwaukee 1, Wis.

Write for Complete Catalog 5601.

BRADLEY WASHFOUNTAINS and SHOWERS are Distributed Through Plumbing Wholesalers.

engineers design entire projects.

In his position as chief coordinator and supervisor, the consulting engineer advises a client on the hiring of subcontractors for installation of air conditioning, water supply systems, heating, electric power, and acoustics. The engineer also may be the main link with equipment manufacturers and suppliers, for the engineer writes the specifications. However, legal responsibility for the guarantee of the equipment rests with the contractor.

Government aid to public enterprise is resulting, consulting engineers feel, in a decrease in their scope of activities. However, consultants frequently get government and municipal contracts.

Many planning and engineering offices (such as TAHAL, Water Planning Ltd.) have been established by the government to plan all projects involving institutional construction. Israeli consultants are opposed to such government agencies, contending that they are not necessary.

Mass immigration, from all parts of the world, has given Israel technicians with varying cultures, professional backgrounds, degrees of training, and experience. Many of Israel's new engineers have come from Germany, Austria, Czechoslovakia, Poland, and Russia, with fewer coming from Rumania, Italy, the United States, Great Britain, and Holland. Despite this diversity of talent, Israel also utilizes foreign engineering firms although an attempt is made to limit their use because of a scarcity of foreign currency in the new nation.

The complexity of many recent projects has forced Israel to depend on a number of foreign firms. The Construction Aggregates Corp., of the United States, reclaimed 25,000 acres of the Hulah swamps in Galilee. In cooperation with an Israeli contracting firm, the Royal Netherlands Harbor Works did a $2 million modernizing job on the Haifa port. The *Societe Dunkerquoise D'Entreprises et Constructions,* of France, recently obtained a contract for building a subway in Haifa, in cooperation with a local contractor. The same French firm now is re-

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FEATURES DUNHAM-BUSH FIN-VECTOR RADIATION

Consulting Engineer: Richard Shipman Leigh, Woodbury, Conn.
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Dunham-Bush Fin-Vector Radiation is used exclusively in a recent addition to the Woodbury School, providing maximum comfort per fuel dollar. The hot water system permits use of economical heavy fuel oil.

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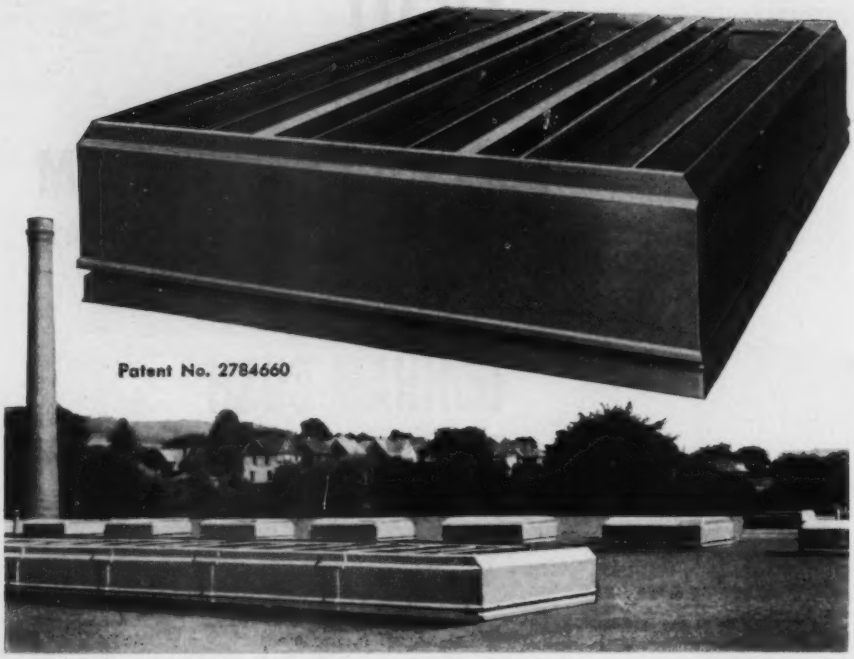

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ported to be negotiating for a similar project in Tel Aviv. The *Societe Dunkerquoise* and a British firm also are being considered for construction of a railway which would link the Dead Sea area with the Red Sea via the rocky Negev desert — a project estimated at "tens of millions of dollars."

The Cementation Company, of England, has built a large silo near Haifa, and several U.S. consultants have been working on a number of plants to produce chemicals and fertilizers.

A team, including leading U.S. experts, worked with TAHAL on blueprints for the $115 million Jordan River hydro-irrigation project. Most of the work on the $23 million Yarkon pipeline was done by Israeli engineers. Plans for a second $25 million Yarkon pipeline, also involving a number of pumping stations, have been completed.

A Belgian consulting firm drew plans for a copper smelting plant which will be erected near Eilath, in the Red Sea area.

A team of U.S. consultants is reorganizing the Dead Sea Potash Works, of Sodom. Plans for the enlargement and modernization of the Haifa sewerage system have been prepared by Alexander Potter Associates, of New York. Kershaw & Kaufman, of the U.S., also has planned a sewage project for Tel Aviv. A French consulting firm is expected to get a similar contract from Jerusalem.

A number of foreign consultants are under contract to oil companies that are prospecting and drilling in various Israel areas. However, Israel oil companies are training local persons as quickly as possible to reduce the firm's dependence on foreign engineers.

Other prospective programs, on which foreign consultants are considered necessary, include a deep sea port on the south, on which exploratory talks have begun; a large plant for manufacturing concrete irrigation pipes; shipbuilding installations for Haifa; and a petroleum pipeline from the now famous Gulf of Aqaba to Haifa, which France has requested built but which has not been approved by Great Britain or the United States. ▲▲

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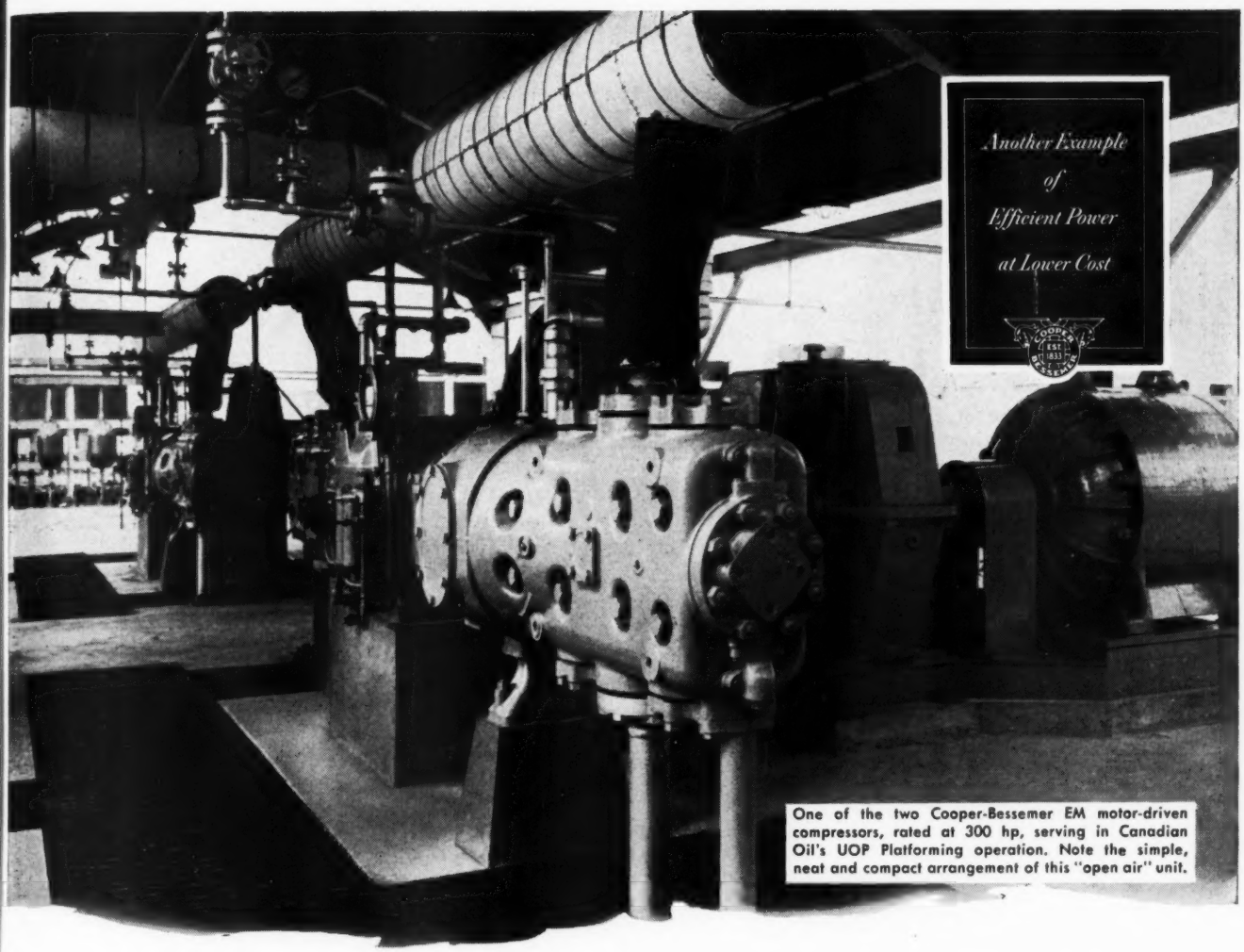

One of the two Cooper-Bessemer EM motor-driven compressors, rated at 300 hp, serving in Canadian Oil's UOP Platforming operation. Note the simple, neat and compact arrangement of this "open air" unit.

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COOPER-BESSEMER 2-cylinder motor-driven M-Line compressors efficiently recycle hydrogen for the UOP Platforming unit in the Sarnia, Ontario, refinery of Canadian Oil Refineries, Ltd.

Cooper-Bessemer developed compressors with non-lubricated cylinders have permitted Canadian Oil Refineries to run its Platforming unit thousands of hours without any possibility of contaminating the recycle gas with lubricating oil.

Canadian Oil's Platformer is charging nearly 3800 barrels per stream day, and producing high yields of gasoline with an octane number reaching well into the 90's. In this process, Cooper-Bessemer EM's continue to play a vital and dependable role in the production of high octane gasoline.

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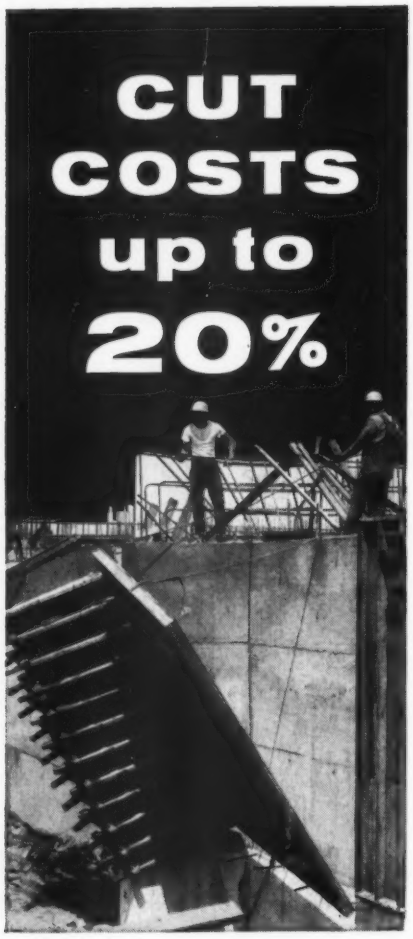

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Notes From Abroad

No Nails, No Cracks

Hardwood floors, with no shrinkage cracks, are being produced by Norwegians by glueing the individual floor boards together instead of nailing them to floor beams. The floors shrink as one unit away from the wall, where the gap is closed by inserting new boards.

When cold water (casein) glue is used, glue is applied in the usual way. Work must be done quickly, because the glue starts to harden as soon as it is applied.

The problem of glue hardening too quickly has been avoided by the use of a hardening agent. The adhesive is applied to one side of the boards and the hardening agent to the other. In this way, no hardening takes place until the two surfaces are pressed together.

The Norwegians use wood that has been dried artificially so that the moisture content is reduced to 9 to 12 percent.

Eight to ten boards at a time are pressed together tightly with a wedge. The outside boards are nailed lightly in place. Before the shrinking starts, all nails are removed. Because some glue usually is spilled, the finished floors are sanded. However, sanding expenses can be avoided by squeezing the glue from the joints as the boards are laid.

Since shrinkage will be concentrated near two opposite walls large cracks will occur there. An extra board is placed beneath the flooring, level with the floor's bottom surface. The wall paper is folded over the baseboard under the flooring. An extra strip of paper is placed between the paper and the floor boards to prevent them from being glued together. The baseboard is fastened only temporarily, so it can be removed when new boards are placed later.

The Norwegians say the glued floors, practically free from cracks, entail little additional costs over traditional methods using nails.

Needs Custom Crane

The largest crane in the world will have to be constructed to lift the components for Scotland's new atomic power station.

The British report that the crane must have a 200-ft span between the legs — the same as the center span of London's Tower Bridge. The machinery also must be capable of lifting up to 300 tons.

New Aluminum Uses

Canada's Naval Research Establishment, at Dartmouth, Nova Scotia, has discovered a new, more efficient method of electroplating copper on aluminum.

The scientists say their new technique will have uses ranging from the home appliance field to copper plated aluminum wiring in aircraft, shops, automobiles, and buildings.

Copper plated aluminum wires also can be soldered readily and assume copper's other favorable properties.

U. S. to Tell Achievements

The United States, as one of 41 nations participating in the International Conference on Large Electric Systems next year, will be allowed to present eight technical papers dealing with achievements in the fields of high voltage power generation and transmission in this country.

The conference is scheduled for June 4 to 14, 1958, in Paris.

Membership on the U. S. Committee is open to all engineers.

running into low ceilings?

get new GUTH SLIMLUX...only 4¼ inches deep!

Low modern ceilings call for slender surface-mounted fixtures, and Guth answers the call with ceiling-hugging SLIMLUX.

SLIMLUX operates cooler, too. It's built extra-rugged—with high-quality ballasts—to maintain 90° (or lower) operating temperature and give top ballast performance. Be sure that the surface fixture you specify is heat-tested!

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. . . for every application. Here are some of your choices:
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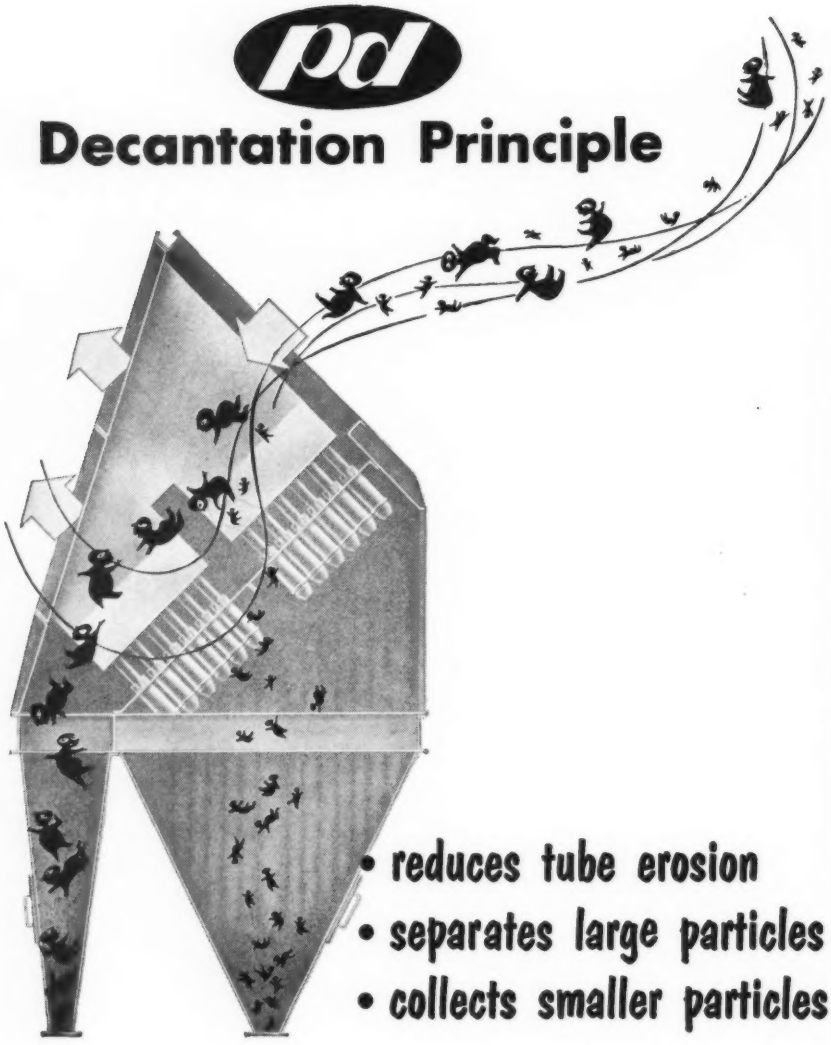
Decantation Principle



• reduces tube erosion
• separates large particles
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This basic P-D principle provides a unique system that separates large, high-carbon particles for refiring, and small flyash particles for disposal. And a decantation system can be installed for a very small additional cost, no additional area or pressure drop and very little added height. Features unique patented *PLENAFLO internal ducting.

Larger particles with sharp coke and cutting edges are the primary eroding elements of flue dust. These are primarily skimmed off before the dust-laden gas enters the tube and returned for refiring.

The Thermix Corporation are project engineers for Prat-Daniel. Contact them on this unique collector system. They will also be glad to give you information on P-D Standard Tubular Dust Collectors, Fan Stacks, F.D. and I.D. Fans and other components.

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POWER DIVISION: Tubular Dust Collectors, Forced Draft Fans, Air Preheaters, Induced Draft Fans, Fan Stacks

Present membership of the national group consists of 262 electrical engineers associated with consulting firms, utilities, industries, and educational institutions.

Selection of the subjects and authors of technical papers to be offered by the United States will be made by a technical subcommittee, under the chairmanship of C. W. Franklin, electrical engineer of Consolidated Edison Co. of New York, Inc.

The U. S. committee has been invited to hold its June meeting this year in Montreal, Canada.

Save Beer's Waste Heat

The French have devised a method for utilizing the waste heat in breweries for refrigeration.

In the past, when hot vapor from the wort escaped into the atmosphere, hundreds of thousands of calories — representing useful energy — were lost. The vapor from the wort now is collected on its way up the flues and diverted towards the boiler by a blower. There it condenses as it gives up its heat, while an air-release valve allows any noncondensable gas to escape into the atmosphere.

Distilled water, at 95 C, is collected in a tank and fed into a steam generator. The water which collects at the bottom of the condenser is used in the absorber unit, from which it flows at approximately 40 C.

Build Nickel City

Plans for a $175 million nickel project in the Mystery-Moak Lakes area of Northern Manitoba have been announced by Premier Douglas Campbell, of Manitoba, and Henry S. Wingate, president of International Nickel Company of Canada, Ltd.

The project will be one of the largest nickel-producing operations in the world and will be the largest single investment of any kind in Manitoba.

The province and Inco have agreed on the establishment of a new local government District of Mystery Lake. Inco also has agreed to undertake the $32 to $38 million construction of a large power plant at Grand Rapid, on the Nelson River. The company

Unretouched photo shows what happens when a boiler feed line is clogged with calcium carbonate deposits. CAUSE: *lack of chemical stability in feed water.* REMEDY: *properly balanced water treatment.*

LINE OF MOST RESISTANCE

A heavy build-up of scale, like that shown in the illustration, will gradually reduce the effective diameter of feed line piping, and will result in seriously restricted carrying capacity.

The line must be shut down for maintenance or replacement, causing expensive down time in the plant. Proper water conditioning will prevent this unnecessary loss. This is but one of the many problems presented by the corrosive elements of water.

In Dearborn's complete line of water conditioning products, there are treatments to eliminate scaling, sludge, carry-over, return line corrosion and other similar difficulties. Dearborn combines the proper treatment with the right control methods under technical supervision. The result: less down time and greater operating efficiency.

Dearborn Supervisory Service provides you with the three elements necessary to maintain the best in a water conditioning program—positive control, top performance effectiveness and maximum economy.

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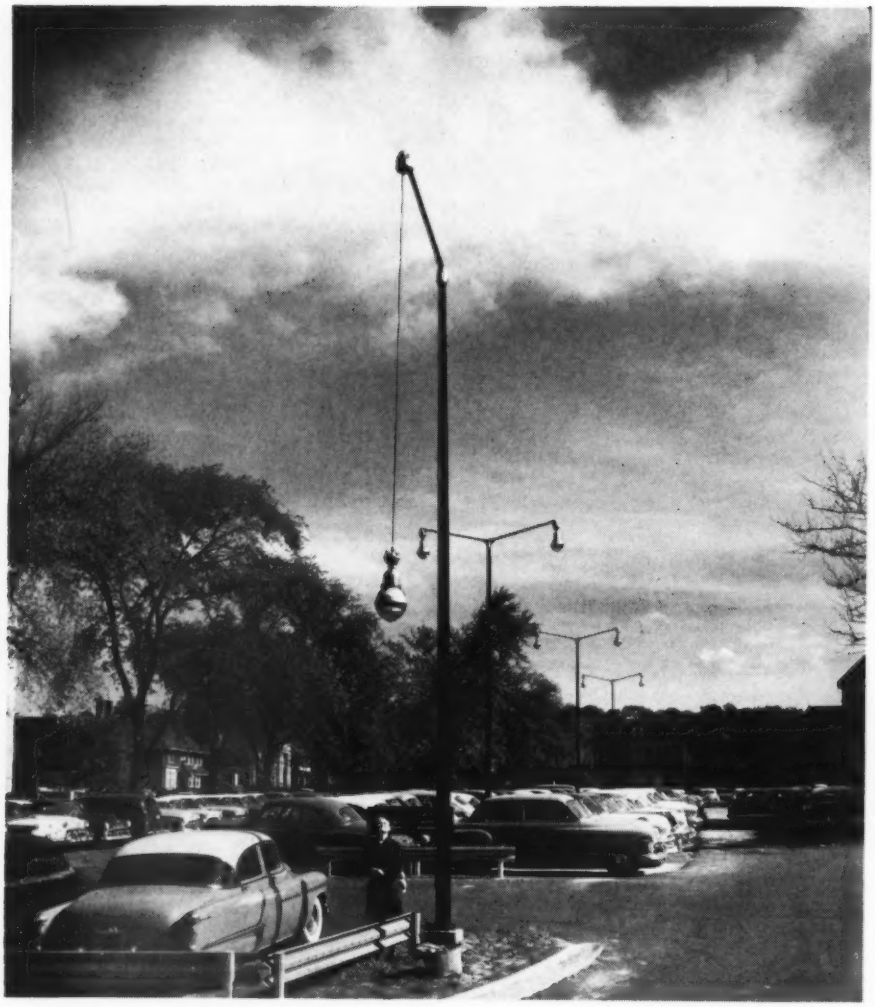
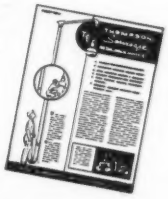


MAINTENANCE COSTS ARE IN FOR A "LET DOWN" WITH Servisafe POLES

BECAUSE . . . servicing costs automatically come down with the lights *when one man can relamp and clean pole-mounted luminaires at ground level!* The entire operation can be accomplished in minutes . . . day or night . . . rain or shine.

With "Servisafe" Metal Poles, maintenance men carry only a detachable hand-line to operate the disconnecting and lowering mechanism. No ladders, no assistants, no waste motion. And no climbing or electrical hazards.

"Servisafe" Poles are available in single and double-arm models, as shown above, in a variety of standard styles . . . steel or aluminum construction.

FOR DETAILS AND PRICES, WRITE FOR BULLETIN WPH-54 . . . OR CALL SUPERIOR 1-7626.

THE THOMPSON ELECTRIC CO.
1202 POWER AVENUE • CLEVELAND 14, OHIO

7297-TE

will assist the province in financing the power plant by way of a four-year $20 million loan bearing two percent interest during the construction period. Later, the loan will be converted into debentures repayable in installments over a 20-year period.

The new mine sites are about 400 air miles north of Winnipeg, on Hudson Bay. The power plant will be about 50 miles northeast of the mining operations and approximately 10 miles northwest from present rail lines.

Inco will supply school and hospital facilities and other services for the town, which is being planned for an initial population of about 8000 persons including a working force of about 2000.

Airborne geophysical exploration led Inco geologists to the Moak Lake region after a trapper-prospector's finding took them to Mystery Lake. The Manitoba territory in which favorable mineralization has been found is 75 to 80 miles long, about five miles wide.

Germans Prefabricate Frames

Window frames of reinforced concrete now are being produced by *Bram,* a German firm, which contends that the frames can be installed in 30 to 40 minutes at a savings of up to 35 percent.

The frames, made from concrete having sufficient thermal insulation and stability, are provided with a dense external skin at the factory. The frames neither shrink nor swell.

The larger the window, the more economical the reinforced concrete frames. Frames of any size can be made with a comparatively small number of molds. The recessed frame section, against which the window wings are set, also can be arranged in any desired position — facing in or out.

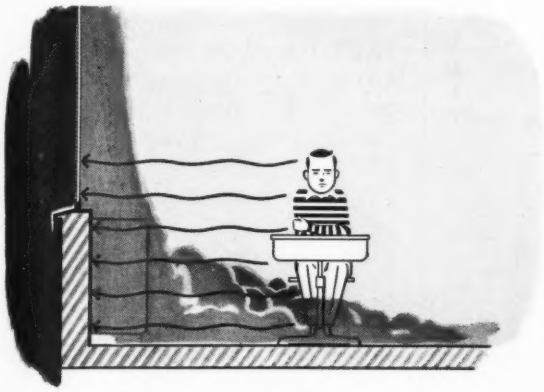
Bram officials said they have had no trouble in transporting the bulky frames over long distances without damage. For installation, a rotary tower crane is needed for unloading and lifting frames.

French Project in Peru

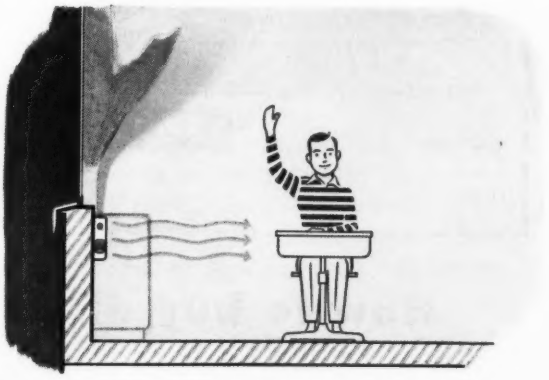
La Corporacion Peruana del Santa has contracted with two French firms to construct a hydroelectric plant on the Rio Santa,

Wind-o-line Radiation makes the difference!

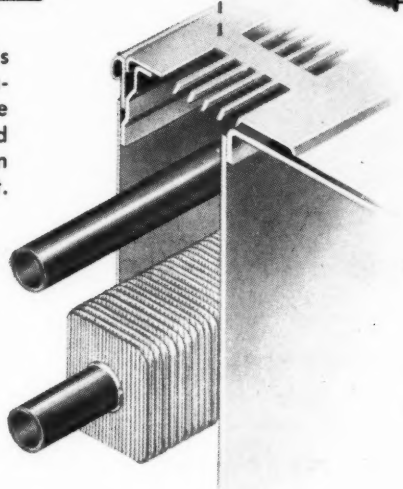
Indoor thermal comfort is related not only to room air temperature, but to the temperature of the surrounding surfaces as well.



Without Wind-o-line Protection, pupils seated near large windows are uncomfortable on cold days because they lose too much body heat to cold surfaces and are exposed to chilling downdrafts—even when the room air temperature is right.



With Wind-o-line Protection, windows, outside walls and floor are warmed to offset the loss of body heat, and a rising blanket of heated air warms and diverts the chilling downdraft. Now all students sit in a *protected learning environment.*



Wind-o-line Radiation installed all along the cold window wall is the bonus feature in the Nesbitt system of heating, cooling and ventilating. Wind-o-line may be concealed by wall-hung enclosures or Nesbitt storage cabinets.

The Nesbitt Series Hot Water Wind-o-line System provides *the protected learning environment at proven lower costs.* You save through: elimination of costly pipe trenches, runouts and pipe covering; smaller pipes and pumps; factory installed piping in the unit ventilator.

The Added Protection of Wind-o-line Radiation Increases the Yield of Good Teaching

Send today for your copy of Publication 101. It tells how you may obtain more learning per school dollar.

CLASSROOM HEATING AND VENTILATING EQUIPMENT BY **Nesbitt**

Made and sold by John J. Nesbitt, Inc., Philadelphia 36, Pa. Sold also by American Blower Corporation and American-Standard Products (Canada) Ltd.

GOULDS PUMPS, INC., Seneca Falls, New York

Check bulletins you'd like to receive:

☐ Pump Fundamentals. A brief outline of the characteristics, operation and criteria for selecting reciprocating, rotary, and centrifugal pumps.

☐ 710.1 "Close-cupld" Centrifugal Pumps.

☐ 721.6 Single-stage Double-suction Pumps.

☐ 725.4 Centrifugal Chemical Pumps.

☐ 726.1 Vertical Centrifugal Pumps.

Name_____ Title_____

Company_____

Address_____

City_____ Zone_____ State_____

How to buy a better pump

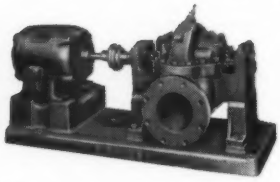
When you have to choose from dozens of pumps of different types and brands, it's hard to tell which will work best for you at the least cost.

However, when you know what to look for and how to look, you can match a pump to your needs almost exactly.

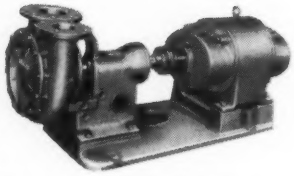
Just five of hundreds of bulletins we've prepared to help you buy wisely and well are offered above. Send for them and use them when you need a general purpose pump.

When you have a particular application in mind, write us the essentials. We'll be glad to advise you on the pump or pumps that will work best for your purpose.

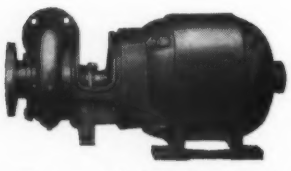
4 general purpose pumps



1. For large capacity pumping, the Goulds Fig. 3405. 33 sizes with capacities up to 6400 GPM; heads to 425 ft. Send for Bulletin 721.6.

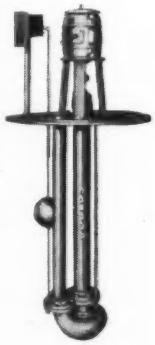


2. For economical handling of hot, corrosive or abrasive liquids, the Goulds Fig. 3715 stainless steel pump. 9 sizes with capacities up to 720 GPM; heads to 200 ft. Send for Bulletin 725.4.



3. For use where space is at a premium, the Goulds Fig. 3655 "close-cupld" pump. 20 sizes with capacities up to 2000 GPM; heads to 400 ft. Send for Bulletin 710.1.

4. A submerged-type sump pump for depths of 3 to 20 ft., the Goulds Fig. 3047. 4 sizes with capacities from 10 to 650 GPM; heads up to 65 ft. Send for Bulletin 726.1.



MEMBER

Goulds PUMPS INC. Seneca Falls New York

Branches: Atlanta • Boston Chicago • Houston New York • Philadelphia Pittsburgh • Tulsa

West Coast Representative: Goulds Pumps Western, Portland, Ore.
In Canada: The A. R. Williams Machinery Co., Ltd. in all principal cities.

build and equip a steel mill near the plant, and supervise the operations of both for several years.

The project will include a 114-ft long dam and hydro stations designed to produce an annual one billion kwh. A 56-mile long line, of 138,000 volts, will connect the main hydroelectric station to a substation at Chimbote. About 15,000 feet of the line pass over the Great Cordillera of the Andes, making this the highest high-tension line in the world.

French sources said the hydroelectric and steel plants should be ready to go into operation sometime this spring, with the aid of French operating personnel.

An American firm had begun the harnessing of the Rio Santa when a torrential flooding of the river burst the artificial lake and destroyed the dam, washing away a concrete bridge and obstructing the canal. French technicians are rebuilding the dam.

Largest and straightest of the Peruvian coastal rivers, the Rio Santa flows through a succession of gorges, descending 1640 feet in only six miles.

Above it All

Through the heart of Tokyo, an elevated mile-long highway soon will offer motorists a way to rise above the city's congested traffic problems.

Under the entire highway's length, space will be left for construction of businesses and garages. The project is scheduled for completion in 1958.

Increase Building

Canada has announced a substantial increase in capital spending this year for utilities, commercial, and institutional structures.

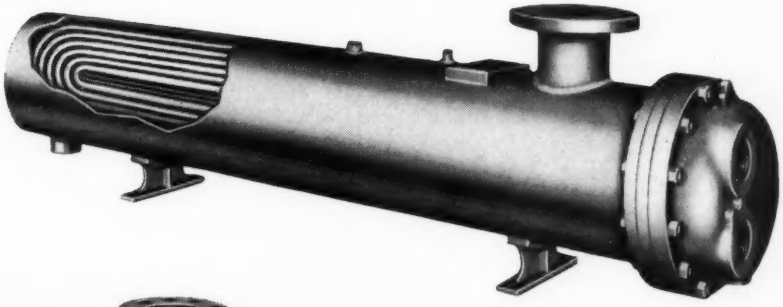
The budget, of $8.5 billions, stresses expenditures for power developments, pipelines, and also transportation facilities. The 17-percent increase planned in institutional building will be made up of marked increases in expenditures for churches and hospitals, and moderate advances in spending for schools and universities.

More modest advances are predicted for industry. Accelerated programs in iron, steel, and transportation equipment will be offset

Specify WHITLOCK WATER HEATERS for every service

STORAGE Whitlock Type K Storage Heaters provide adequate supplies of hot water at all times. Everdur construction assures lifetime service: made also in Eterno and Standard Steel. A wide range of sizes for every requirement. Bulletin 40B.

INSTANTANEOUS Whitlock Type R Instantaneous Heaters are used where hot water at a nearly uniform rate is desired. The U-tube bundle is removable. Other designs also available. Bulletin 20A.



CONVERTORS Whitlock Type R Convertors are widely used for space heating systems in all types of buildings. The two-pass design furnishes hot water with minimum pressure drop. Made in a full range of sizes, for typical pressure. Bulletin 62.

Designing and manufacturing water heaters for thousands of installations gives us a background as hot water specialists which can be useful to you when you're selecting and specifying such equipment. Whitlock Water Heaters are widely used in hospitals, laundries, mills, hotels, schools, and industrial plants . . . large and small . . . where their record of performance is outstanding. We have standardized heaters ideally suited for the majority of applications, and also design and build water heaters to meet special needs. We will gladly assist you with any water heating problems . . . ask us for suggestions when you're specifying your next job.

The Whitlock Manufacturing Co., 96 South Street, West Hartford 10, Conn. New York, Philadelphia, Boston, Detroit, Chicago, Richmond. Authorized representatives in other principal cities. In Canada: Darling Brothers, Ltd., Montreal.

Whitlock

WHITLOCK Designs and builds: bends, coils, condensers, coolers, heat exchangers, heaters, piping, pressure vessels, receivers, reboilers.

THE WHITLOCK MFG. CO., West Hartford 10, Conn.

Send following bulletins:

☐ Storage heaters Bulletin 40B ☐ Instantaneous Heaters Bulletin 20A

☐ Convertors Bulletin 62

Your name..... *Title*.....

Company.....

Address.....

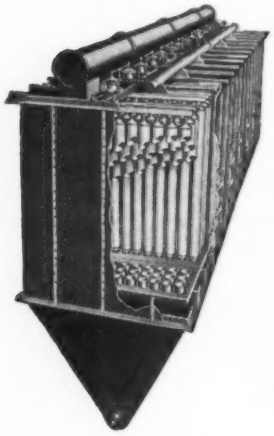
.....

Norblo solves dust problems

Whatever you need in dust or fume control, be sure to check *Norblo*

In Bag Type, Centrifugal or Hydraulic dust collecting systems, Norblo Dust and Fume collection equipment has many design advantages. These three types, frequently used in certain combinations, provide economical dependable control as required in smelting, rock products, chemical, milling and processing fields.

What is the best approach to your dust problems? Norblo helps you select—applies engineering skill and "know how" gained in first hand experience of over 40 years in many industries.



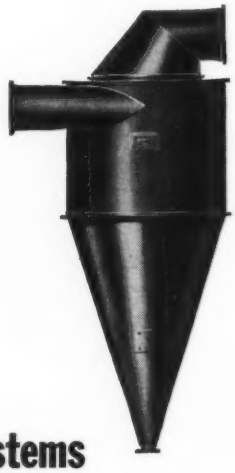
Norblo Bag Type Systems

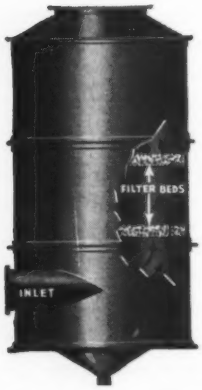
Automatic and Standard

For continuous or heavy duty service providing very high efficiency at very low cost of operation and maintenance. Basic unit contains 78 bags, 6″ diameter, 8′ 3″ long. Air flow is upward, from inside, thus keeping bags fully distended. Total free cloth area per compartment 936 square feet. Shaking and cleaning controlled by electric timer, is cyclic, one compartment at a time, each having its individual compressed air shaker mechanism and the whole system variable and adjustable for dust load without shutting down . . . Also Norblo Standard Bag Type (non-automatic).

Norblo H. E. L. S. Centrifugal Systems

A cyclone or centrifugal type collector for all materials, from sawdust to fly ash; characterized by high efficiency of collection with low static drop. The Norblo H. E. L. S. has no internal vanes, gadgets or dampers. High efficiency is obtained by scientific proportioning and by the patented (No. 2,259,919) expanding nozzle. These design features eliminate the power-wasting back eddy. Built in standard sizes with capacity up to 37,500 cfm.





Norblo Hydraulic Systems

A high efficiency, wet type collector, for separation of dust mixed with smoke or fumes. In most installations the Hydraulic unit is used with a Norblo Cyclone collector, thus reducing the amount of wet sludge to be handled. No moving parts. Filter beds are coke or high-fired ceramic tubes, light weight and kept in motion by ascending air stream. Beds are self-cleaning. Built in standard sizes with capacities up to 26,000 cfm.

Take advantage of the efficiency and low maintenance available through Norblo Equipment in these three proved systems of dust and fume collection. Write for full information.

The Northern Blower Company

6426 Barberton Ave., Cleveland 2, Ohio • OLympic 1-1300

Norblo ENGINEERED DUST COLLECTION SYSTEMS FOR ALL INDUSTRIES

partially by a reduced rate of spending by the wood products, paper and pulp, and building materials groups.

An investment program of this type will involve an increased emphasis on construction of an engineering nature, the Canadian government pointed out.

Order Ocean Liner

The French Lines have placed an order for an ocean liner, the *France*, to be constructed on the general plan of the *Normandie*.

The new liner, with a double hull, will have nine decks and be subdivided into 14 water-proof compartments. Accommodations will include space for 500 first class passengers, 1500 tourist class, and 100 automobiles. The liner also will carry 8660 tons of fuel oil — enough to enable the ship to make a round trip between Le Havre and New York without refueling.

Firm Foundation

Russian engineers are reported to have developed a method of giving weak subsoil the foundation properties of brick.

Tunnels, 25 to 38 inches in diameter, are dug at a depth of one to three feet in the porous soil. A combustible mixture of air and gas then is introduced under pressure. After the tunnels are sealed, the mixture is ignited.

The high temperatures result in a "brick" foundation.

French Build Observatory

Men from France's National Center for Scientific Research are spending an estimated $1,800,000 — plus equipment costs—to build a new National Geophysical Observatory near Pouilly-sur-Loire.

Seven laboratories will house special equipment for scientific studies to be made there. Houses are being built for the 70 scientists and technicians who will form the permanent staff.

Giant Bridge to Span Seine

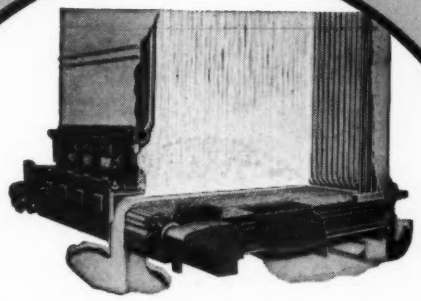
In France, 12 engineering firms are working on what is to be Europe's largest suspension bridge—connecting the portions of northern and southern France which

USE DETROIT SPREADER STOKERS TO BURN SOLID FUELS WITHOUT EXPENSIVE PREPARATION

DETROIT ROTOGRATE • ROTOSTOKER • ROTOSTOKER (TYPE C-C)

HIGH ECONOMY AND AVAILABILITY • LOW MAINTENANCE

1



DETROIT ROTOGRATE

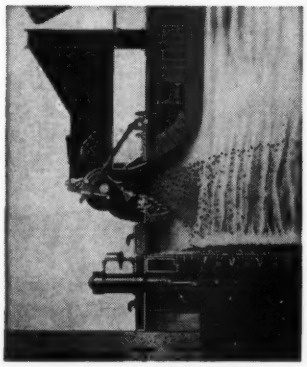
Original spreader stoker with forward moving grates that discharge the ash at the front. Our long experience has contributed to many exclusive refinements and features of design. Proven superiority with hundreds installed here and abroad. For capacities up to approximately 400,000 pounds of steam per hour.

Detroit Stokers burn any Bituminous Coal or Lignite without special preparation. Commercial sizes ranging from ⅜" x 0" to 1¼" x 0" are ordinarily used. High burning rates without clinkering difficulties. Also many refuse fuels including wet bark, hogged wood, bagasse, etc. are burned separately or in combination with coal; efficiently and without smoke.

Widely fluctuating loads are easily handled. Parasite power is negligible. High overall efficiencies at all capacities are assured. Maximum availability and very low maintenance.

Buy "Detroit"—They are "the most".

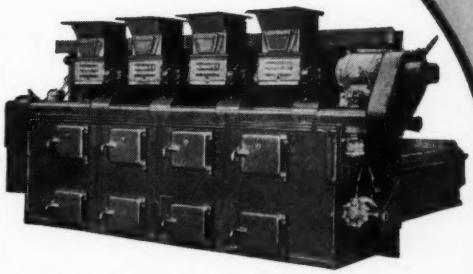
2



DETROIT ROTOSTOKER

For small and medium size units. Power Dumping, Hand Dumping or Stationary grates to fit the furnace provide desired capacity under full automatic control.

3



DETROIT ROTOSTOKER (TYPE C-C)

Continuous cleaning type particularly suited to highly fluctuating loads. Many sizes for capacities of 5,000 to 75,000 pounds of steam per hour. Reciprocating grates discharge ash at front. No basement is required.

DETROIT STOKER COMPANY

MAIN OFFICE AND WORKS
MONROE, MICHIGAN

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WRITE FOR BULLETINS ON THESE MONEY SAVING STOKERS

If you have TUBES or PIPES from ½" to 12" I.D. you can't clean thoroughly

Try ROTOJET®

Rotojet Tube Cleaners, driven by air, steam or water, are made for straight or curved tubes and pipes from ½" to 12" I.D. Send us your problem.

ELLIOTT COMPANY - ROTO DIVISION
Tube Cleaner Specialists Since 1910
148 Sussex Avenue, Newark, N. J.

are separated by 77 bridgeless miles of the Seine River.

Scheduled for completion in early 1959, the bridge will feature three suspended spans supporting a continuous metallic roadbed 3152-feet long between the two anchorage blocks, each of which will contain 700,000 cu ft of prestressed concrete.

Fifteen thousand tons of steel will be used, including 3210 tons for supporting cables and vertical sling cables.

Between the two anchorage blocks, the cables will be of an unbroken length, with four additional cables for the two side spans.

At present, the only method of crossing the Seine River between Rouen and the coast are 10 ferries. The ferries carry an average of 200,000 vehicles, 800,000 persons, and 510,000 tons of goods yearly.

The French National Roadbuilding Investment Fund will finance the $11,500,000 project. Income from pedestrian and vehicle tolls is expected to repay the loans within 18 years, reducing the toll charges and eventually allowing the bridge to become the property of France.

Friction Welding

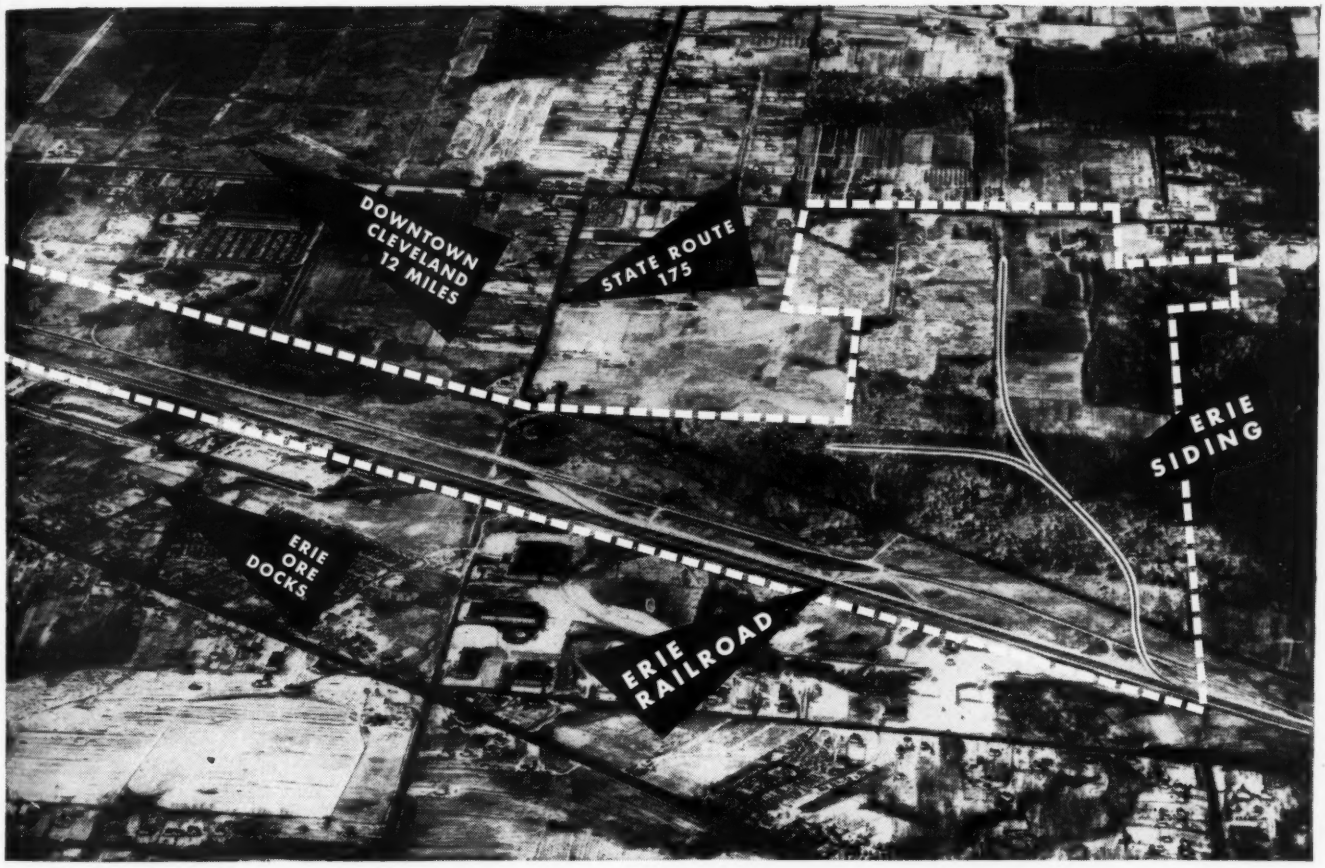
The Soviet All-Union Scientific Research Institute of Electric Welding is testing a method of welding steel by friction that has been developed at the Vrubsky mine in Stavropol Krai. The method reportedly requires 10 to 15 times less power than ordinary welding methods and improves the quality of the weld. One of the pieces to be welded is gripped in the holding device of a turning machine tool while the other piece is placed in the cutter holder. The resulting friction heats the metals to melting point. Pipes can be welded by this method if their ends are placed in close contact and rotated in opposite directions.

Tunnel Under Canal

Automobile and railway tunnels from Amsterdam under the North Sea Canal are approaching completion. An underwater connection has been made from the Amsterdam bank to the north bank.

The automobile tunnel, designed for traffic of 10,000 to 12,000

YOUR NEW PLANT WILL GROW IN THE ERIE AREA



NEW PLANT SITE JUST 12 MILES FROM DOWNTOWN CLEVELAND

Excellent Location for Manufacturing Plant or Distribution Center

If your plans call for a good rail site near a large city, investigate this 200-acre plot in Bedford Heights, Ohio. It is owned and served directly by the Erie Railroad. Within the past ten years the immediate surrounding vicinity has been developed with well-diversified industrial plants.

In addition to the fast-growing Cleveland industrial area, the important industrial centers of Youngstown, Warren, Akron, Canton, Massillon, Lorain and Elyria are all within a 50-mile radius. Lake port facilities are also nearby.

In this heavily-populated area you will find a broad supply of labor, including some of the most highly skilled workmen available anywhere. Nearby suburban living accommodations are well diversified.

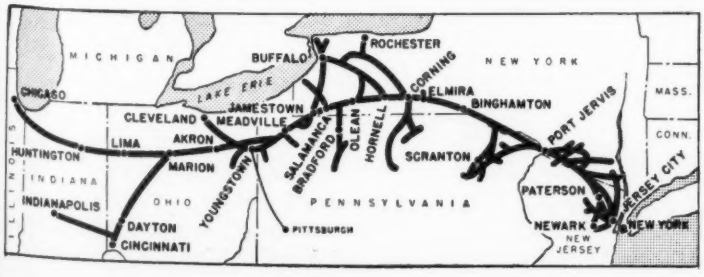
This site is level land and tests have proved ground conditions are excellent. It is served by all necessary utilities. Taxes are very reasonable.

In addition to direct transportation service by the dependable Erie Railroad, the area is near a four-lane, limited access highway, and an interchange with the new North-South Ohio Turnpike will be within a mile of the site.

For full details, in strictest confidence, about this metropolitan location—or other sites in the Erie area—mail the coupon below. Your inquiry will receive our immediate attention.

Erie Railroad

DEPENDABLE SERVICE FOR THE HEART OF INDUSTRIAL AMERICA



ERIE

D. M. Lynn, Assistant Vice President
Industrial Development
Room 524-R, Erie Railroad Company
Midland Building, Cleveland 15, Ohio

Dear Sir: Please furnish us, in strict confidence, additional information on the above and other plant sites in the Erie Area.

Name _____

Title _____ *Company* _____

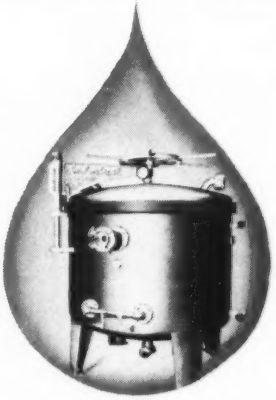
Address _____

City _____ *Zone* _____ *State* _____

Water Problems?

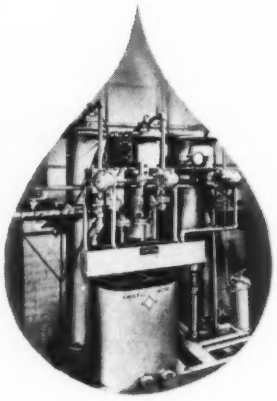
Industrial can help you decide which kind of water treating equipment will best satisfy your clients' needs.

First of all . . . Industrial builds all kinds of water treating equipment. This means that our Water and Waste Treatment Division can recommend **without partiality** the most efficient and economical unit your client can use. Second . . . this division is staffed with **C.E.s** and **M.E.s** so your specification is backed by a competent chemical analysis and **the recommended design is thoroughly engineered** to cover all chemical and mechanical factors. Finally . . . you'll find our equipment in most auto and appliance factories; in many chemical, textile, sugar and paper plants; petroleum fields and refineries—just about anywhere that purification of liquids is important.

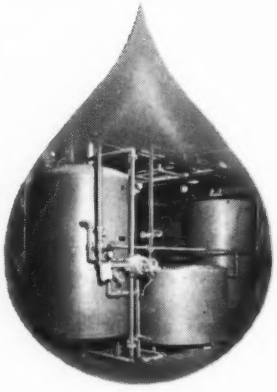


Here are some logical applications of different kinds of equipment

Filtration for paper mill waste. This large Vertical Leaf Filter takes the sludge out of paper processing water. It is the most economical way for a New Jersey mill to avoid violation of anti-pollution laws. Industrial makes all kinds of filters, Horizontal, Vertical, Tubular, Hydra-Shoc. All can be adapted to complete automation and can be arranged with a host of rapid cleaning and convenience features.



Ion Exchanger purifies plating bath water. Many metal finishing operations (plating, painting, anodizing) require rinse water better than drinking quality. Minute amounts of mineral in these waters will cause stains in plating, pinholes in paint coats and retard pickling processes. This modern chemical device can up-grade quality, save labor and pay for itself in a surprisingly short time. This one is at work in the Sunbeam plant in Chicago.



Zeolite Softener prepares boiler feed water. This unit in an Indiana appliance plant prevents scale formation in boiler tubes by replacing calcium and magnesium ions with sodium ions. The water achieves "zero" hardness in one rapid pass through the exchanger bed. The unit is useful for washing operations, food canning, textiles and other processing affected by hard water.

Want detailed literature? Just a note telling us how you'll use the water will do.

Industrial

INDUSTRIAL

FILTER & PUMP MFG. CO.

5932 OGDEN AVENUE • CHICAGO 50, ILLINOIS

vehicles per day, is 2520-feet long. The separate tunnel for the electric railway will have two tracks.

The $130 million project was begun in 1952.

Hot Rolling Process

The USSR metal working industry has put into wide use a Russian developed machine tool for hot rolling of grinding mill balls with diameters from 1½ to 3 inches. The balls had been made with punching hammers, friction presses, and casting molds and then forged.

Ultrasonic Instrument

Soviet scientists are reported to have developed an ultrasonic instrument for detecting flaws in metal components. Previous instruments based on reflection of sonic waves were suitable only for laboratory use. The new industrial method involves transmission of waves of 160,000 cycles with the result registered on an oscillograph.

After 30 Years

The Ogochi Dam, a giant reservoir capable of holding 180 million tons of water to provide power for Tokyo's millions, is scheduled to be completed this spring after a construction period of 30 years.

Along with the 488-foot dam, six bridges have been built to span the artifical lake. About 20 miles of new road now circle the reservoir, which has a circumference of 24 miles.

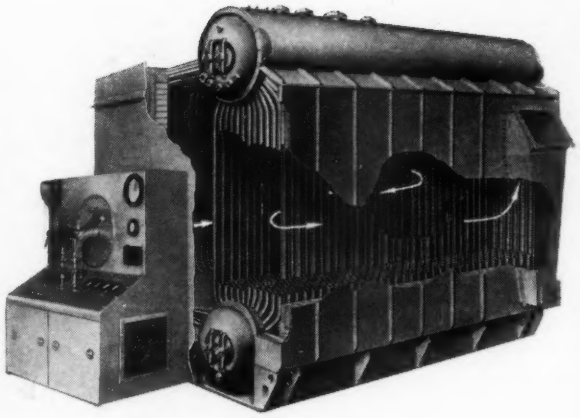
At least four hydroelectric power stations for the reservoir are scheduled for construction at a later date.

Argentina Under Study

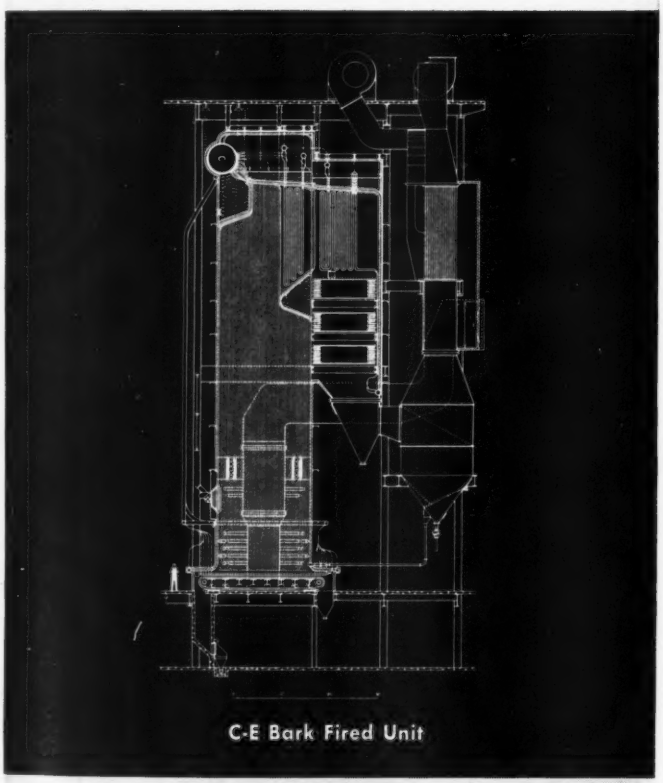
An economist, an economic advisor, and three engineers are being sent to Argentina by the World Bank to study the general economic situation and that Latin nation's investment plans.

The mission, sent at the request of the Argentine government, will be joined later by an agricultural advisor.

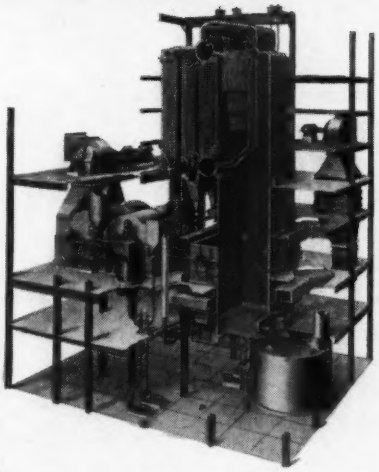
During its six weeks visit, the World Bank Mission will study agriculture transportation, and power needs of Argentina. This is the Bank's first delegation to visit



C-E Package Boiler



C-E Bark Fired Unit



C-E Recovery Unit

Need Steam?

See C-E!

If you need steam and are concerned with how best to burn fuel to generate it efficiently, reliably and economically – See C-E.

Why? Because C-E has a complete line of steam generating and fuel burning equipment both standardized and custom-made to fit all the specialized requirements of different industries. Here, for example, are C-E units for burning Black Liquor, Waste Sulfite Liquor, Bark, Hogged Wood, Coal, Oil or Gas as used by the pulp and paper industry.

The widespread acceptance accorded C-E equipment by the Pulp and Paper Industry is evidenced by the following facts.

In the past 10 years . . .

. . . leading pulp and paper mills have purchased C-E Boilers for power and/or process requirements having an aggregate capacity of more than 16,000,000 lb of steam per hour.

. . . nineteen leading mills have reordered C-E power boilers. In fact, one internationally known paper company placed nine separate orders.

. . . 115 C-E Chemical Recovery Units have been purchased by pulp mills throughout the world. These include units ranging in capacity from less than 100 tons to the world's largest, having a capacity in excess of 650 tons.

. . . twenty-six leading pulp mills have reordered C-E Recovery Units; of this number, two mills have reordered twice, three mills three times and one mill four times.

. . . The C-E Bark Burning System has been installed in numerous pulp mills at home and abroad. Performance records show greatly increased efficiency and substantial savings over old-fashioned bark burning methods.

This acceptance of C-E Steam Generating Equipment in the pulp and paper industry has its counterpart in virtually all industries requiring steam for heat, power or process. That is why, before you buy, you should See C-E.

COMBUSTION ENGINEERING

C-E

B-927A

Combustion Engineering Building
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New York 16, N. Y.

all types of steam generating, fuel burning and related equipment; nuclear reactors; paper mill equipment; pulverizers; flash drying systems; pressure vessels; soil pipe

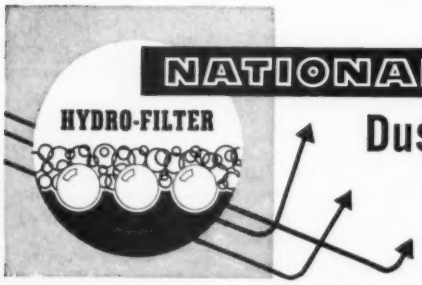
WHO SAID you can't combine efficiency and ease of maintenance in a dust collector?
EFFICIENT. Turbulent area of water, bubbles and mist assures constant, sustained air water contact.
EASY MAINTENANCE. Dust never comes in contact with dry surface. Sludge is settled, removed automatically. Glass spheres are self-cleaning.

Hydro-Filter offers real simplicity to wet collection problems

Simplicity is the *success* of the National Hydro-Filter and is why it offers constant dust collection efficiency to the micron range *combined* with low operating costs and maintenance that amounts to but *minutes a month!*

Look at the photo—Every inch is *active* space. There is nothing to clog, no baffles to "load up" and reduce efficiency. Water, air and glass spheres do the work and a constant flow of water carries contaminants to the sludge tank where they are automatically ejected.

Sound simple? . . . It is, and the whole story on Hydro-Filter is contained in a comprehensive bulletin that is available on request. Write for your copy today.



Dust Collector Corp.

606 Machinery Hall Bldg.,
Chicago 6, Illinois
Subsidiary of National Engineering Company,
Manufacturer of Simpson Mix-Mullers.

Argentina since it became a Bank member last September. The mission, starting in Buenos Aires, will visit many Argentine cities.

Furnace Cooling

A system of hot water cooling for open hearth furnaces invented by a Ukrainian engineer is expected to increase the serviceable life of furnaces.

In the old system water absorbed only a limited amount of heat from the furnace. The new method utilizes boiling water to cool by evaporation. It requires about 1/20th of the amount of water previously used and furnishes steam for production purposes and for heating.

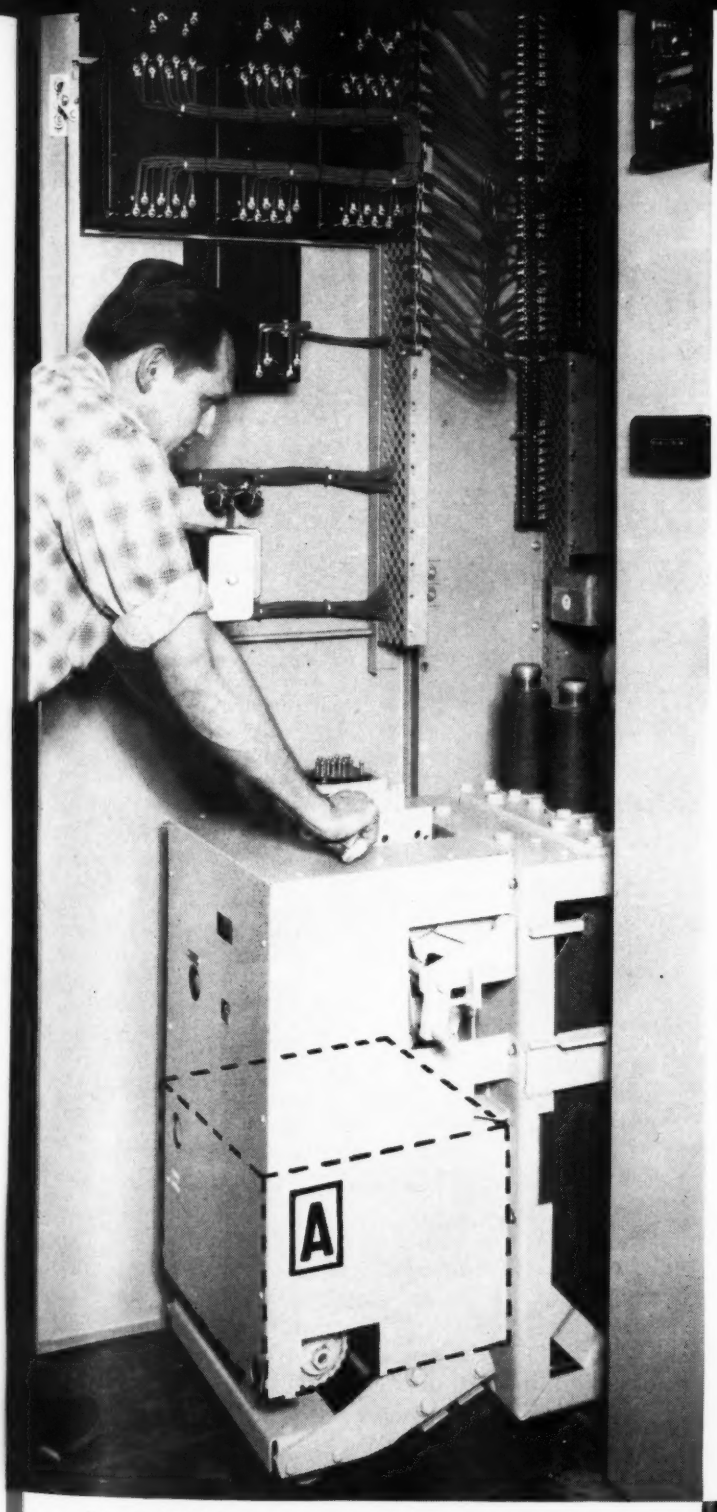
The Stalino metallurgical works is equipping a blast furnace with the steam cooling and expects the system to yield 170,000 tons of steam daily for use in the plant.

Pechora-Vychegda Scheme

Soviet civil engineers have devised a scheme to make waters of northern rivers in Russia flow into the Caspian Sea by way of the Kama and Volga Rivers. Preliminary estimates show that the output of electric power by hydroelectric stations on the Kama and Volga could be increased by as much as 10 billion annual kw-hr.

The plan provides for the building of a dam on the Pechora River near Ust-Voi, resulting in a reservoir embracing the entire upper reach of the river. Two more reservoirs also would be formed, one by a dam on the Vychegda River, and one by a power station on the Upper Kama River. The three reservoirs would be linked by canals, making it possible to turn the entire flow of the Pechora and the Vychegda into the Kama, and from there into the Volga River and the Caspian Sea.

This would mean a transfer of about 41 cubic kilometers of water annually. The additional power, however, could be generated without installation of such elaborate facilities. It would be possible, instead of cutting canals and creating reservoirs, to build hydro stations on the Pechora and Vychegda and feed the power into a unified power grid. ▲▲



A 90% cut in control power for Metal-Clad Switchgear

A stored energy closing mechanism, latest of the engineering and design developments which make General Electric your most modern metal-clad switchgear buy, now offers you a 90% reduction in control power requirement. Magne-blast circuit breakers with interrupting ratings of 150 MVA or over are optionally available with this mechanism.

Here's what this feature can do for you:

1. Eliminates requirement for 125 volt or 250 volt metal-clad operating battery.
2. Simplifies control power distribution system.
3. No high current voltage drop problems.
4. Permits simultaneous closing of any number of breakers without the high current problem.
5. Omission of AC closing rectifier eliminates associated maintenance and operating problems.
6. Built-in feature provides for safer, faster, manual emergency closing in event of loss of control power.

For additional information on this optional feature, write to Section 511-25, General Electric Company, Schenectady 5, New York.

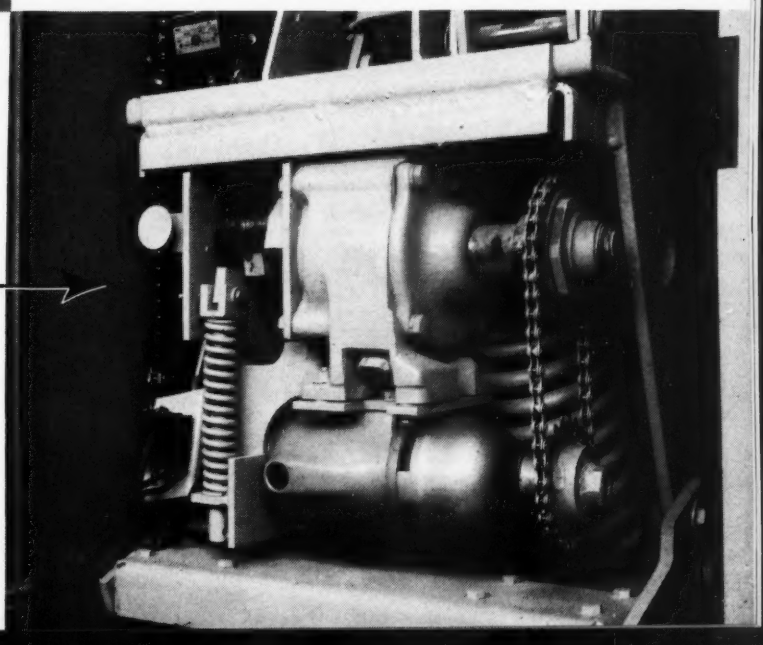
Progress Is Our Most Important Product

GENERAL ELECTRIC

IN ADDITION to the optional stored energy closing mechanism, General Electric Metal-clad Switchgear and Magne-blast breakers offer all the PLUS values of solenoid-operated equipment, such as Self-X insulation, and easy maintenance.

A

ENERGY IS STORED in powerful springs. To close a breaker, it is necessary to energize only a low-energy release coil with the control switch and the springs do the rest. The springs are recharged by a fractional horsepower gear-motor in a few seconds.



News for the Consultant

Consulting Engineers Council Adopts Code of Ethics

The Consulting Engineers Council, by unanimous action, adopted a code of ethics (see below) at a board meeting in Atlanta on Feb. 8-9.

The code was prepared by George W. Poulsen Jr., Salt Lake City, Utah, chairman of the ethics committee, assisted by Howard F. Eckerlin, Syracuse, New York, and R. J. Thompson, Oklahoma City, members of the committee.

Copies of the code, printed on high grade paper suitable for framing, will be distributed to all Council members.

CODE of ETHICS

WITH high regard for the Engineering Profession, and recognizing in the Code of Ethics of Consulting Engineers Council a set of dynamic principles to guide his service to his fellow men, a member of Consulting Engineers Council . . . . . .

1. Brings credit, honor and dignity to the Engineering Profession in his dealings with clients, other Engineers, and the public.
2. Acts for his clients as a faithful agent or trustee and accepts remuneration only in accordance with his stated charges for services rendered.
3. Exchanges Engineering information freely with other Engineers, students, and the Engineering press, encourages the public knowledge of Engineering, and insures proper credit for Engineering work.
4. Upholds the principle of appropriate and adequate compensation for Consulting Engineers and those in their employ.
5. Upholds the professional reputation of other Consulting Engineers and respects their Engineering agreements.
6. Solicits commissions for Engineering work according to high professional standards, without advertising in a self-laudatory manner, offering commissions, or using undue influence.
7. Negotiates fees and contracts without entering into price competition of any nature for Engineering services.
8. Associates as a Consulting Engineer only with Engineers and other professionals who conform to ethical practices.

Real Cool Future Shown by Survey

A recent survey of 50 power companies and water departments in large cities throughout the country shows substantial gains in air conditioning with predictions of consistent future growth.

Each company participating in the survey, which was conducted by the Trane Co., reported marked increases in the installation of air conditioning in its area, as measured through tons of refrigeration on its lines. The percent of increase was more pronounced in the South, but not appreciably greater than in other sections of the country.

The Seattle Department of Lighting reported a substantial increase in air conditioning, "although the Seattle area seldom experiences excessive summer temperatures." The utility credited the increase to internal heat loads caused by human heat, lighting, and service machinery motors.

Eugene O. Bauman, chief of the New York Bureau of Water Register, said the trend in New York's larger office buildings, hotels, and other commercial establishments is away from window-box air cooling units and toward well engineered central systems with water conservation devices.

A 140 percent increase in air-conditioning tonnage in the Pittsburgh area by 1965 was forecast by Duquesne Light Co.

Modern Drainage System Aids Kentucky Race Track

Rainy weather no longer means a long period of slick, hard track at Lexington's Keeneland Race Course. With the aid of a new drainage system, a soft, dry cushion now protects the tender feet of racing thoroughbreds.

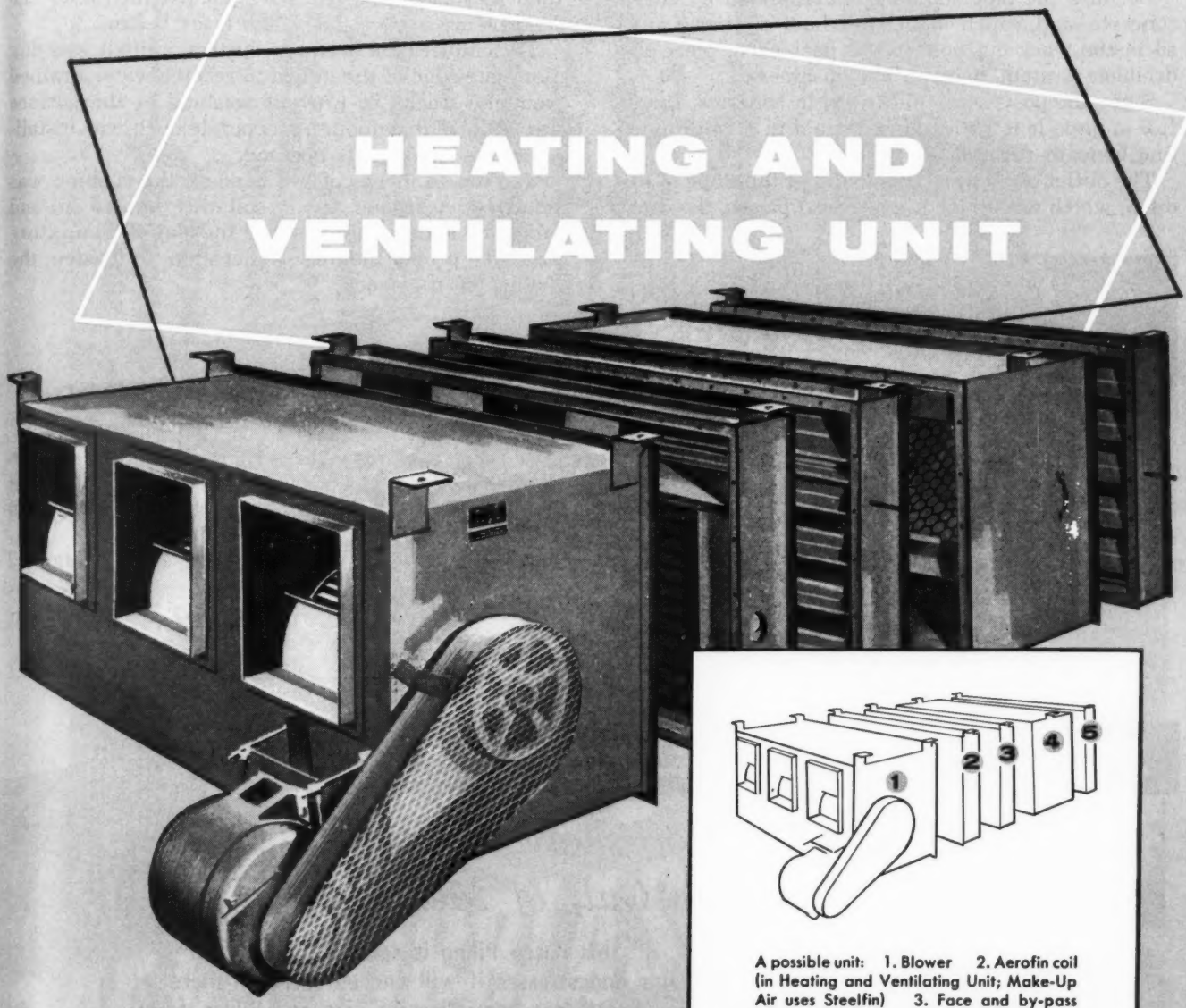
Before the new drainage system was installed, Keeneland Association officials were unhappy about water standing on the running surface too long—especially near the inside rail.

Henry C. Scott, project engineer, and J. Stephen Watkins, consulting engineer, both of Lexington,

. . . the Make-Up AIR family

proudly presents a new addition . . .

HEATING AND VENTILATING UNIT



A possible unit: 1. Blower 2. Aerofin coil (in Heating and Ventilating Unit; Make-Up Air uses Steelfin) 3. Face and by-pass 4. V-type filter 5. Shut-off damper.

. . . versatile, all-purpose interchangeable components for Make-Up AIR and general ventilation applications . . .

The Make-Up AIR, using Steelfin coil, now adds to its family a heating and ventilating unit, using Aerofin copper coil. All sections are individually supported, and are removable for maintenance or replacement. Nine basic blower sections are available, in any rotation. Write now for bulletin 567.

nyb

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found the track's subsurface had a high clay content.

For a drainage system, to be installed before the track was improved, the engineers selected 6-in. perforated pipe, capped at each end, with a tee connection for a non-perforated outlet pipe to the ditch.

Because the pipe should be surrounded by sharp concrete sand, which could cause hoof injuries if mixed in the track cushion, it was decided to place the drainage system beneath the inside rail.

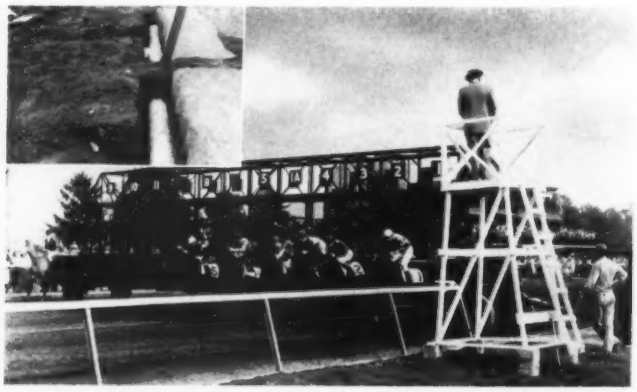
Since the posts were imbedded in concrete, the 9-ft 6-in. pipe lengths couldn't be laid in a continuous line beneath the rail.

The outlet pipes were beveled to fit the slope of the ditch, which was sodded. At several places, the ditch was covered with metal pipe-arch to provide crossings to the infield. Where the ditch was covered, tee-connections were provided for outlets.

To confine the sharp concrete sand filler around the pipe, the trench was lined with burlap. The pipe then was backfilled and the burlap folded over the sand before excavation on the track began.

To complete the drainage system, a ditch was dug along the edge of the infield to receive water drained from the track. To prevent washing of the surface during hard downpours, a concrete curb was installed with a small grate opening.

The top 15 inches of soil beneath the cushion was removed. A special sandy soil was hauled in and mixed by a motor grader until the clay-sand mixture had the proper degree of aeration to hasten the drying of the track.



RACE TRACK PREPARED FOR RAINY DAY.

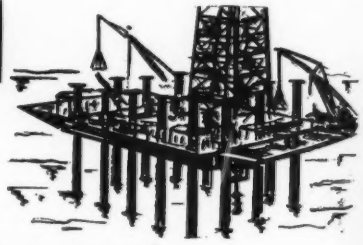
Heating and Air-Conditioning Engineers, Architects, Plan Cooperative Program

A joint committee has been appointed by the American Society of Heating and Air-Conditioning Engineers and the American Institute of Architects to encourage cooperation between consulting engineers, architects, and the air-conditioning industry.

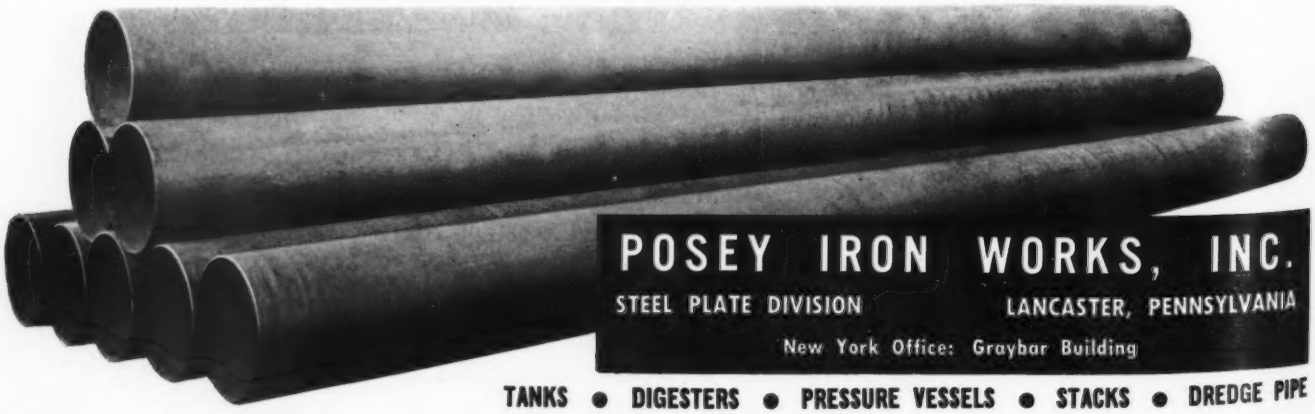
John E. Haines, past ASHAE president from Minneapolis, and Paul Schell, AIA member from

POSEY PILING...

. . . fabricated for off-shore drilling in the Gulf of Mexico



40′ long, 30″ O.D., ½″ wall . . . this Posey Piling is soundly constructed to withstand the severe strains and stresses it will encounter in off-shore drilling in the Gulf of Mexico. Posey Iron specializes in Pipe and Piling, from 20″ O.D. and larger, fabricated from wrought iron, carbon steel, low and high alloy steel, and alloy clad steel. A half-century of experience, plus modern equipment and engineering facilities, make Posey Iron a recognized source for fabricated pipe and piling for every purpose. Call in Posey Iron on your next pipe or piling job. Information and quotations without obligation.

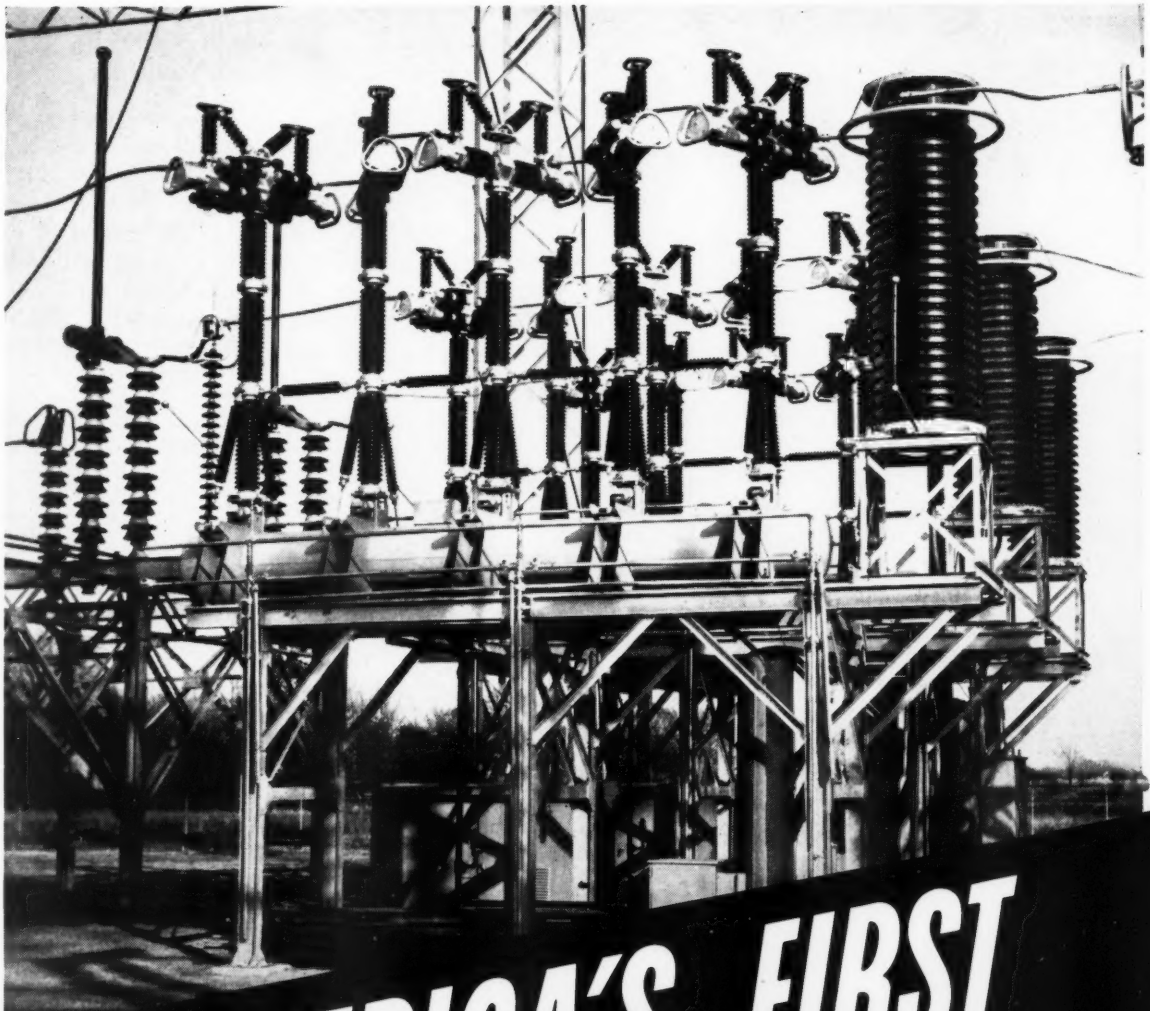


POSEY IRON WORKS, INC.

STEEL PLATE DIVISION LANCASTER, PENNSYLVANIA

New York Office: Graybar Building

TANKS • DIGESTERS • PRESSURE VESSELS • STACKS • DREDGE PIPE



AMERICA'S FIRST 345 kv AIRBLAST BREAKER

BROWN BOVERI

THE largest Airblast Breaker ever installed in the United States was designed and built by the world's pioneers of Airblast Breakers, Brown Boveri. This 345 kv, 3-cycle breaker, with an interrupting capacity of 25,000,000 KVA, is in service at the East Lima Substation of the Ohio Power Company and is one of two such units in the American Gas and Electric System.

Contact Brown Boveri, the leaders in the field, if you want the BEST in BREAKERS!

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Atlanta, Ga. • Birmingham, Ala. • Boston, Mass. • Buffalo, N. Y. • Butte, Mont. • Chicago, Ill. • Cleveland, O. Denver, Colo. • Detroit, Mich. • Hamilton, O. • High Point, N. C. • Houston, Tex. • Jacksonville, Fla. • Kansas City, Mo. Knoxville, Tenn. • Lewiston, Me. • Miami, Fla. • Minneapolis, Minn. • New Orleans, La. • New York, N. Y. • Pasadena, Cal. Portland, Ore. • Roanoke, Va. • San Francisco, Cal. • Seattle, Wash. • Syracuse, N. Y. • Tucson, Ariz.

Pittsburgh, were appointed co-chairman at a recent organizational meeting.

Additional ASHAE committee representatives are Cary B. Gamble, New Orleans; Hermann C. Hoffmann, Syracuse; Peter B. Gordon, New York; and John Everetts, Jr., Philadelphia.

AIA members include James B. Newman, New York; George S. Idell, Philadelphia; and Angelo R. Clas, Washington.

Haines and Hoffmann, of ASHAE, are to compile data on commercial and industrial air conditioning.

Standards for air conditioning buildings, as determined by geographical area, type of building, use, and occupancy, are to be developed by Gamble, Gordon, and Everetts, of ASHAE. This information is to include facts about temperature, humidity, cleanliness, air movement, and noise levels. Cautionary details also will be given on the effect of light loads, window areas, and insulation on the cost and effectiveness of air conditioning.

Additional costs for the installation and operation of an air conditioning system in buildings with large glass areas will be investigated by Hoffmann, of ASHAE, and Schell, of AIA.

Haines, of ASHAE, is to prepare a talk covering types of air conditioning, costs, purposes, effectiveness, and reaction on the efficiency of occupants. This speech is available for meetings of engineers, architects, or other interested groups.

Michigan CE Association To Hold Organizational Meeting

The first meeting of the proposed Michigan Association of Consulting Engineers will be held in the Spartan Room of the Olds Hotel, Lansing, Mich., at 7 p.m., April 26.

T. E. Roche, a member of the board of directors of the Consulting Engineers Council, will outline the steps to be taken in formation of the new group.

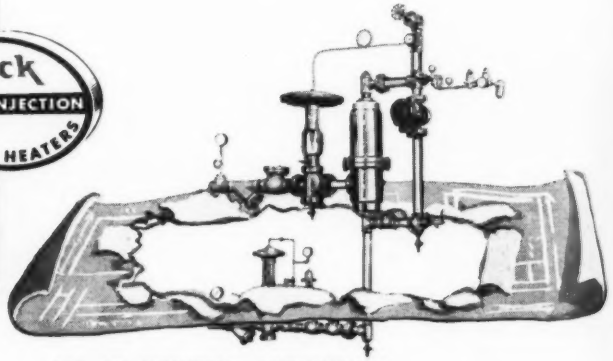
For more information, contact W. B. MacWhirter, 1017 Cottage Grove, S.E., Grand Rapids, Mich.

Annual Meeting of Council To be in Minneapolis

The Annual Meeting of the National Board of Directors of the Consulting Engineers Council will be held at the Leamington Hotel, in Minneapolis, Minnesota, May 2-4. Directors, delegates, and observers will register on Thursday, May 2, in the room of the Minnesota Association in the hotel. There will be directors' meetings in the morning and afternoon of both May 3 and May 4, and there will be a joint dinner meeting for the Board of Directors and the Minnesota Association of Consulting Engineers at 6:30 p.m. Friday, May 3.

Specify "SAVINGS" for your clients!

Pick STEAM INJECTION WATER HEATERS



INSTANTANEOUS HOT WATER HEATER

Show your client how to save on maintenance and operating costs with a Pick Instantaneous Water Heater. No lost time waiting for water to heat; no lost heat from water standing in storage tanks; no wasted floor space. Designed for high pressure steam (40#-125# psi) the Pick Heaters are the most efficient water heaters your clients can use. Check these other outstanding features.

- Instantaneous Hot Water — no waiting, water is heated in a flash to exact temperature, in volume required.
- No Storage Space — compact design permits out-of-the-way installations in corners, on walls, overhead, etc.
- Maintenance Cost Is Low — can be cleaned in minutes, worn parts easily replaced.
- Exact Temperature Control — Pick Heaters can be operated at high or low loads with minimum temperature fluctuations. And it's done quietly.
- Installation Is Inexpensive — only ordinary pipe connections are required.

FOR ALL INDUSTRIAL APPLICATIONS

Primary Heater
A primary source of hot water up to 300 gallons per minute at 140° F. rise.

Supplementary Heater
Easy installation and accurate temperature control makes them invaluable for "spot" applications near point of use.

"Booster" Heater
To augment overloaded or inadequate facilities. Will automatically "boost" and correct temperature deficiencies.

Mail this coupon today for further information on Pick Instantaneous Water Heaters, to:

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Address..... City..... State.....

Please check below reason for additional information:

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PICK MANUFACTURING CO. West Bend, Wis.

P&H

electronic crane control

makes other cranes old-fashioned!

You wouldn't equip your plant with "last year's model" equipment, would you? Then why consider an old-fashioned overhead crane?

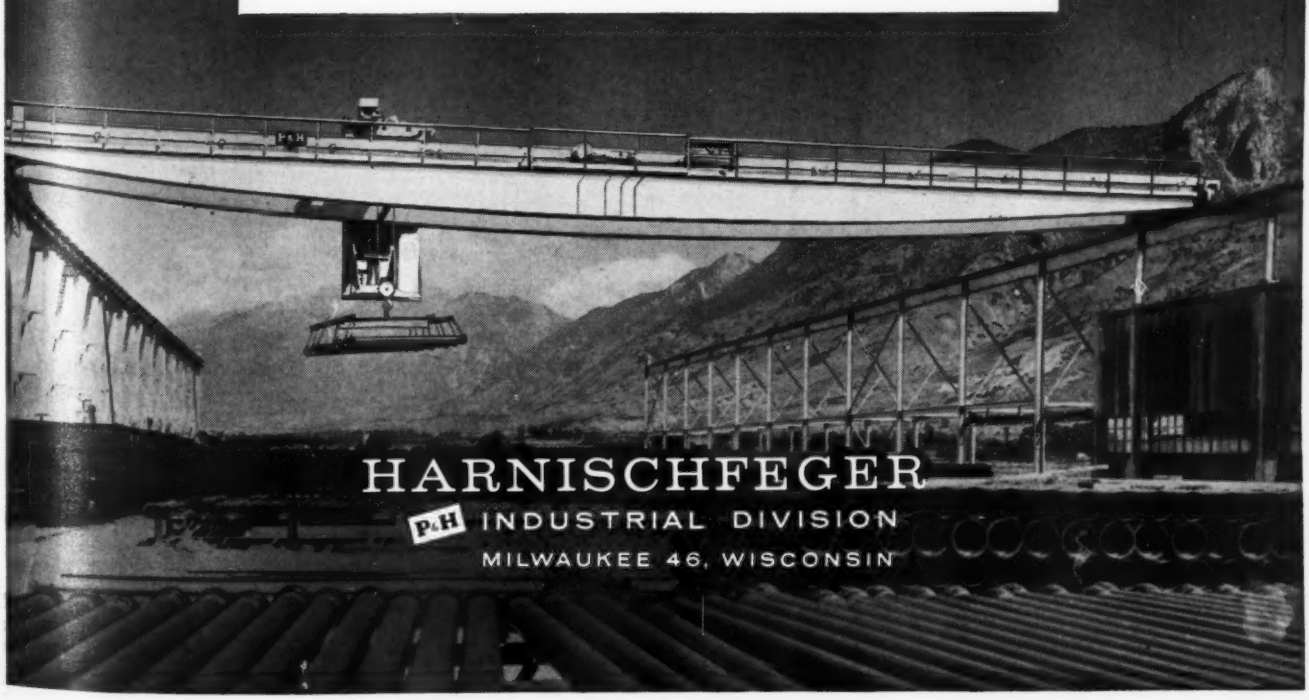
If you buy a crane today without electronic control, you're installing a machine that's already obsolete!

There's only one way to guard against this obsolescence . . . and that's by buying P&H — the *only* crane equipped with electronic "stepless" control. You'll get improved control response plus reduced maintenance . . . field-tested and proven with P&H thoroughness in over 300 installations.

Advanced engineering and modern design have continually made P&H overhead cranes first choice for all overhead material-handling jobs. As a result, there are about as many P&H cranes in service today as *all other makes combined!*

Check this new development, P&H electronic control, before specifying your next overhead crane. Or, modernize your present AC crane installation (any make) with electronic controls.

Write for "Electronic Crane Control," Dept. 105F, Harnischfeger Corporation, Milwaukee 46, Wisconsin.



PENN VENTILATORS / play an important role in providing new SKYLINE BEAUTY . . .

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From skyscrapers to rambling one story plants, Penn Ventilators' silhouettes enhance building appearances. Modern housing designs and efficiently engineered fans reflect well on your specifications. Complete catalogue information is available at the addresses listed below or from the Penn Ventilator man in your area.

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RIGHT ON TOP . . . FOR MORE THAN 30 YEARS

IN CANADA — TORONTO: CONTROL & METERING, LTD., 2271-A BLOOR ST., W. MONTREAL: AIR-CARE, LTD., 2222 BEACONSFIELD AVE. Member of the Air Moving & Conditioning Association

Everyone planning to attend the meeting should write to Hueston M. Smith, 3926 Lindell Blvd., St. Louis 8, Mo., for an application form. The use of this form will permit the Arrangement Committee to make appropriate hotel reservations and meet the incoming delegates at airport or station. The committee will also analyze the travel routes and suggest ways for several persons to travel together on the same plane or train.

The Council extends an invitation to all associations of consulting engineers not now in the Council to send observers to this meeting.

Executive Committee Members, Host

Executive Committee members took time from their busy schedule at the Consulting Engineers Council sessions in Atlanta to have their picture

taken with L. Ralph Bush, president of the new Georgia Association of Consulting Engineers.

Standing, left to right, are William C. E. Becker, treasurer, St. Louis; Edward J. Wolff, secretary, Chicago, and B. M. Dornblatt, vice-president, of New Orleans, La.

Seated, left to right, are C. C. Pate, vice-president, Tulsa; Bush, of Atlanta, and John K. M. Pryke, president, New York.

Closed-Circuit Television Solves Traffic Problems

Closed-circuit television used in traffic controls may be the answer to problems now faced by most American cities.

Speaking before the American Institute of Electrical Engineers in Pittsburgh, Frank P. Barnes, manager of marketing for industrial television at General Electric Company, said closed-circuit television used with radio-controlled traffic lights can move traffic faster, more effectively, and cheaper than any method yet devised.

Under Barnes' proposed method, television cameras would be located at busy intersections. Each camera would be focused on a system of mirrors. By

Can These Men Help You ?

Frank Gaus of Oakland, California and Howard Basile of Durham, North Carolina are Sika dealers. They have just completed one of our week long courses featuring the newest techniques in concrete and masonry construction.

You can benefit from the extensive technical training and field "know-how" of your Sika representative. Let him bring you the latest information on *watertight concrete structures, uniform concrete summer and winter, prestressed concrete beams, steam curing, tremie concrete, revibration of concrete, heavy duty floor construction* and other related subjects.

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"SP-7" 7-blade semi-pressure DUCT FANS

Installed at the Columbus, Ohio plant of North American Aviation, Inc., new Aerovent "SP-7" Belt-Driven Duct Fans, with 7-blade "Macheta" Airfoil Propellers, remove acrid fumes and vapors from a spray-type processing machine. At temperatures of 180° to 200° F., the solution flashes into steam and noxious fumes which would contaminate the entire area if unabated. Located above each end of the spray section, and at intermediate points, the fans induce a steady flow of air through the unit to trap and remove heavy vapors at their source.

Recommended for resistances in the ¾" to 2½" S.P. range, these units, designed for all standard duct systems, move *more air* with less horsepower; provide greater mechanical efficiency with lower initial and operating costs. May be ordered with special-duty motors, alloy propellers and special protective coatings for extreme temperature, moisture or corrosive conditions.

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Steel ring or square panel for wall, ceiling or penthouse. 14" to 60". Used with extended shaft for heat, moisture or corrosion.

DIRECT-DRIVEN DUCT
For installations which permit connection of entire fan assembly in air-stream. For vertical or horizontal use. 14" to 60".

"BI-FLO" DUCT
New divided-duct design, for air-supply or exhaust. Motor located out of airstream. Also serves as stack booster. Sizes 18" to 48".

"EFFICIENCY-ENGINEERED" equipment for every air-handling problem!

Rated in accordance with Standard Test Code and U.S.D.C. Comm. Std. CS178-51.

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Ash and Bacon Sts. Piqua, Ohio

graduated marks on each mirror, distance of traffic from the intersection could be calculated.

A traffic coordinator, seated before a monitor at a central bureau, would have push-button control over the timing of lights at each intersection.

Although many cities already are using radio-controlled traffic lights, none has installed the television monitoring system.

If the television is transmitted by cable, no Federal Communications Commission license is required. If carried by microwave, frequency assignments must be granted by the FCC.

Use of microwave is the most efficient and least expensive method of traffic control, Barnes said. However, before this could be done on a large scale, the FCC must make a complete study of frequency allocations.

Meanwhile, a new development known as "slow scan" soon may permit transmission of both audio and video signals over telephone lines. "Slow scan" is a new closed-circuit television technique that transmits one image every four or five seconds instead of the customary 30 per second.

Michigan Students Give Views On Sanitary Engineer Shortage

Senior students in civil engineering listed salary considerations, a belief that the field may be an unpleasant one only loosely related to engineering, and reluctance to work for government agencies as major reasons why more youths do not become sanitary engineers.

The 33 seniors, at the University of Michigan, were given the questions at the end of an examination they were taking.

"Local governments pay less than private companies" was a recurring answer.

Other disadvantages of working for a local government, as cited by the students, included lack of security, the role of seniority and politics in advancement, and limited opportunities for starting one's own business.

Twenty-one of the students disliked the idea of working with sewage, garbage, "a lower class of people," and communicable diseases.

The sanitary engineer is regarded as "a garbage man who went to college," one student said.

Dislike for the courses required to become a sanitary engineer was mentioned by 14 students.

A widespread feeling that many students learned about sanitary engineering too late in their undergraduate courses also was pointed out.

Then too, there is little challenge in sanitary engineering, seven students believe.

"Sanitary and municipal engineering are established and most of the basic problems have been answered," one wrote.

Other disadvantages cited were a limited opportunity for research, an uncooperative public, results of work "not decisive enough for satisfaction," that the work is mainly administrative, and that the sanitary engineer's duties primarily are those of inspection.

Vertical Versatility

IN PUMPING LIQUIDS FROM SHORT SETTINGS

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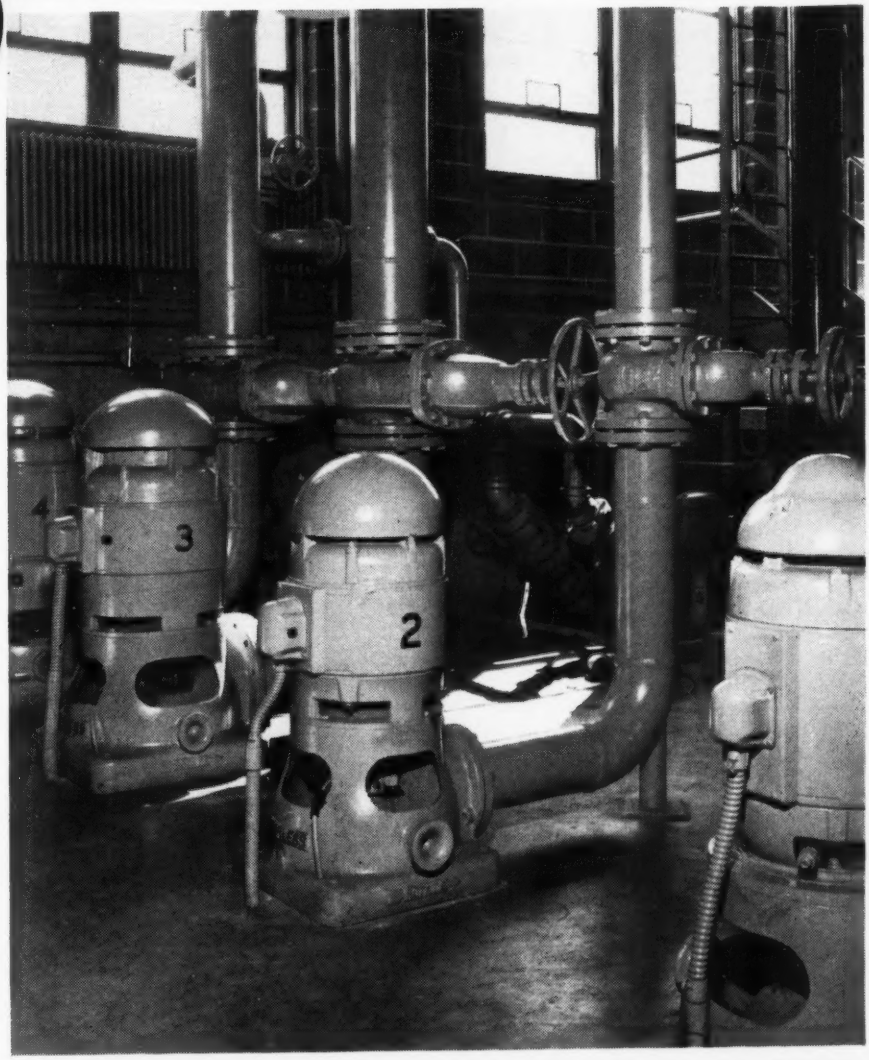
3 PRODUCTION DESIGNS . . . Standard, Heavy-Duty and Special Service Types Provide Widest Flexibility in Application



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Advantages and Features of the Peerless Vertical Industrial Service Pump

→ **SAVES ON PIPING**—Eliminates suction piping.

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→ **SPACE SAVING**—Requires minimum floor space.

→ **ALL TYPES OF DRIVES**—Leading makes of electric hollowshaft and solid shaft motors; right angle gear drives; vertical and horizontal steam turbines.

→ **IMPROVED SUCTION**—New bell mouth suction manifold immeasurably improves water entrance conditions.

→ **HIGHEST EFFICIENCIES**—Peerless advanced vertical turbine design records highest in pump efficiencies.

→ **FLEXIBILITY**—Easiest to adapt to future system needs.

→ **COMPLETE LINE**—Peerless makes available broadest range of vertical turbine pump capacities, head conditions and horsepowers offered by any manufacturer. Capacities: 30 gpm to 40,000 gpm. Heads: up to 1000 feet. Electric drive up to 2500 hp.

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New 16-page bulletin is profusely illustrated, describing completely all 3 Peerless types. Contains new engineering data on sump designs, etc. Write today for your copy.

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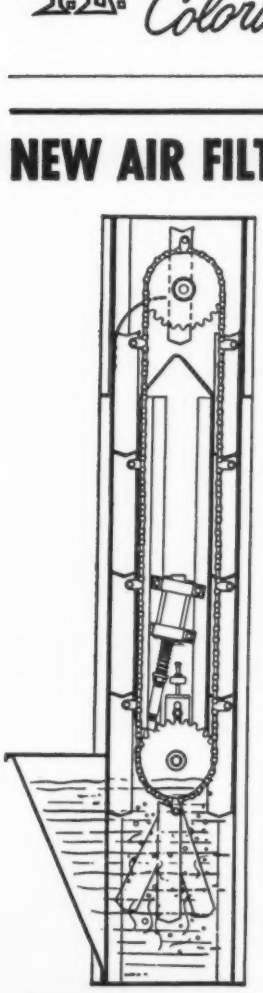
NEW AIR FILTER CLEANS ITSELF



"pulse-type" action keeps Automaze clean as new

Exclusive "pulse-type" action is the secret of the new Automaze air filter. While each panel in the revolving curtain is submerged in the cleaning tank at the bottom, it is agitated vigorously 6 or more times by a compressed air drive. This cleans each panel thoroughly as well as completely renewing the adhesive. Result: Automaze stays clean as new!

New Automaze goes 3 to 6 months without attention—a big improvement over stationary filters that may need cleaning once a month. Even after 6 months, all you need do is remove the sludge. A special reservoir cover makes this a quick, simple operation.

FREE BOOKLET: Send for free booklet for full details on the new Automaze. Write:

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25000 Miles Road
Cleveland 28, Ohio

Try "Moving Sidewalks" In Chicago Experiment

The Chicago Transit Authority is experimenting with a conveyor belt (or moving sidewalk) with a capacity of 7200 persons an hour. The installation carries passengers from a station at ground level to elevated train platforms 22 feet above.

CTA chose the location as a test site because of sharply increased patronage resulting from feeder bus service. At rush hours, stair capacity at the station was inadequate to handle the crowds.

Controls permit operation of the belt in either up or down direction at 125 feet per minute. Designed to carry 100 lbs per sq ft of surface, the belt is a four-ply rubberized fabric, 36 inches wide. Known as a Speedwalk Passenger Conveyor, the equipment is made by Stephens-Adamson Mfg. Co.

If the experiment is successful, CTA officials will consider the system for other heavy traffic points.

Plastic Foam Insulates California Packing Plant

Expanded polystyrene insulation board has been installed in the ceiling and walls of a new Los Angeles refrigerated meat packing plant. Key points in choice of the insulation included water resistance, light weight, and affinity for reinforced concrete—used in ceiling construction.

After the columns were poured and the shoring and metal pan ceiling forms were erected, a single layer of the plastic foam was placed in the forms. The rigid sheets were edge-bonded to each other by coating the edges with a cold setting asphalt. The insulation boards also were lapped and secured with treated hardwood skewers at intersection points.

A special metal chair was used for support of reinforcing steel during installation. This consisted of a standard chair with a flat metal strip welded to the bottom to give increased load distribution. The plastic foam has an average ultimate compressive strength of 3000 lbs per sq in. for uniformly distributed loads, which is more than adequate for the reinforcements and the pouring of concrete.

The concrete was poured directly over the insulation with a crane and bucket. This eliminated the setting of runways for placing concrete with buggies.

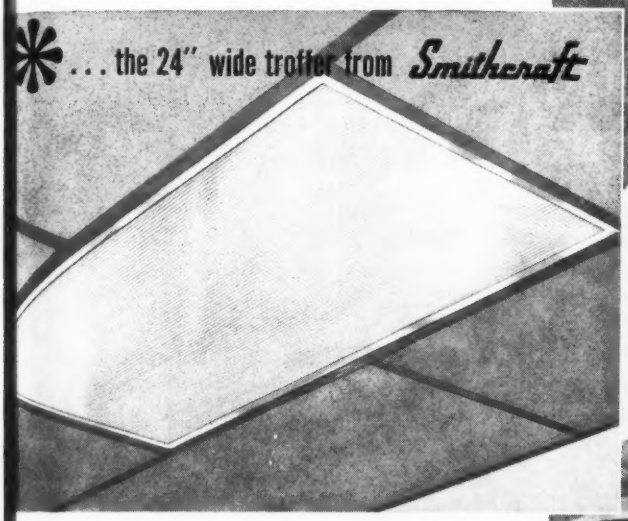
Company Makes Money By Filling Empty Wastebaskets

An eastern firm recently cleared its files and filled its wastebaskets — saving an estimated $68,000 in the process. In 1949 the firm started a new records filing system, neatly indexing and cross indexing all information. In four years the filing cabinets were taking over the office. A clean-out crew systematically discarded everything except current work records.

A Hoover Commission task force, under Emmett Leahy, a records management specialist, found that

the man from Smithcraft . . .

When you put his knowledge of lighting to work for you, your ideas turn into reality. His experience enables him to translate architectural concepts into effective lighting results by applying the flexibility of Smithcraft's line of lighting units. Call him in to consult with you or your lighting engineers on any job on your boards . . . you'll find he knows blueprints and budgets as well as he knows lighting!



New features to aid in your ceiling planning: Great flexibility for design of patterns and interesting lighting effects. Modern, trim, clean appearance, free from light leaks or blemishes. No visible catches, latches, hinges or screws. Door frame opens or closes with simple pressure upwards (patented).

A wide choice of shielding media. Quickly and economically installed in virtually any ceiling construction. Ask the man from Smithcraft to explain these useful new features.

* Arthur W. Siegel, Massachusetts Representative, one of Smithcraft's nationwide sales organization

Smithcraft Troffers and other fine lighting units are installed in thousands of offices, factories, stores, schools and other types of installations from coast to coast. A typical installation is shown at the left — (Metro Troffers in Beerman's Department Store, Dayton, Ohio provide 75 foot candles of evenly-distributed illumination). Wherever good lighting is important, you'll find . . .

SMITHCRAFT — "AMERICA'S FINEST FLUORESCENT LIGHTING."

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PLEASE ATTACH TO YOUR BUSINESS LETTER HEAD and mail to
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☐ Please send me the monthly publication, "Light Side of the News", so that I can keep in touch with the latest trends in lighting.

☐ Please send me "YOUR CEILING PLANNING COMES TO LIFE", a complete handbook on one and two-foot wide SMITHCRAFT ARCHITECTURAL TROFFERS.

☐ Please send me the complete SMITHCRAFT CATALOG, containing data on "America's Finest Fluorescent Equipment".

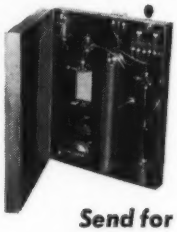
Measure Specific Gravity Accurately!

...and from a remote point

The Petrometer remote reading Specific Gravity Indicator is accurate to .001 Sp. G. unit, with interpolation to .0005 unit! It's easy to install... and operates on the simple, sound principle of a differential bubbler.

An ideal instrument for plant or laboratory for measuring specific gravity of any liquid... paints, fuel, resins, pharmaceuticals, chemical solutions.

All functional parts are conveniently mounted on rear of panel, accessible by swinging open the cabinet door.



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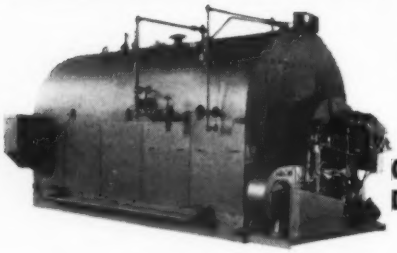
SPECIFY: Dutton EconoTHERM



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CHECK THESE TOP-QUALITY FEATURES:

- Off-center firing with rotary combustion
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- 5 sq. ft. of heated surface per rated h.p.
- One unit, self-contained
- Saves floor space
- No expensive chimney or special foundation
- One piece welded shell
- Factory tested, proved

ECONOTHERM—RATINGS AND CAPACITIES

Equivalent Hp.	20	25	30	40	50	70	80	100
Sq. ft. Water Heat. Surf.	112	129	151	201	300	356	418	510
Lbs. Steam per Hr.	700	863	1035	1380	2070	2450	2760	3500
Equivalent Hp.	125	150	180	200	250	300	400	500
Sq. ft. Water Heat. Surf.	650	814	905	1000	1252	1500	2000	2500
Lbs. Steam per Hr.	4400	5200	6210	6900	8639	10,350	14,000	17,500

WRITE NOW FOR SPECIFICATIONS AND BULLETIN EC-457-CE

Dutton BOILERS DIVISION HAPMAN-DUTTON COMPANY
KALAMAZOO, MICHIGAN • BOILER BUILDERS SINCE 1880

Also Manufacturers of Hapman Bulk Materials Conveyors.

useless paperwork annually costs the U.S. a sum equal to the Federal budget of a half century ago.

Remington Rand warns that it costs more than $7700 to create the contents of a five-drawer file—plus $231 a year to maintain it.

Records management associations found that the calculated risk in destroying important records and correspondence is small, considered to be worth the savings of money, time, and space. They suggest to their clients that essential records be microfilmed and that routine letters and reports be routed to interested parties, then marked for discard.

World's Largest Enclosed Arena Planned for New York Borough

The largest enclosed arena in the world, climate-controlled and designed to seat 150,000 persons, is scheduled for construction in Queens or the Bronx. Sites, ranging from 200 to 400 acres, are available in either borough.

The aluminum arena, with a curved roof and no supports, will cover an area equal to 15 city blocks. A 25-story building could be tucked beneath the center of the roof.

Consulting engineers for the $57 million project are Roberts & Schaefer Co., of New York and Chicago. The architectural aspects were designed by Frank Grad and Sons and Urbahn Brayton & Burrows, Associated Architects.

The arena, to be called Olympic City, is expected to have near perfect acoustical properties, which can be augmented with a hi-fi system for concerts, ballets, and other musical entertainment.

Playing fields will be large enough to accommodate two major league baseball games, or four football games, at one time. The rectangular covered area, built of a series of connected hyperbolic parabaloids, will be approximately 35 acres.

Assisting the consulting engineers on the project are Professor Giorgio Baroni, who has had more than 30 years of experience designing clearspan roof structures, and Syska & Hennessy, Inc., mechanical and electrical engineers.

The hyperbolic parabaloids will be constructed of aluminum flat plates welded and stiffened at the connecting ridges with either extrusions or structural shapes. Plates between the ridges will have additional diagonal stiffening of shallow extrusions welded in continuous lines to the upperside.

The eight ridge sections of the roof will bear on reinforced concrete bents or buttresses, which in turn are carried to rock by means of pile clusters. Between each ridge, the loads will be transmitted through the plates to the edges and then downward through the supporting walls to the foundations.

The end walls will be constructed of a series of braced structural metal frames or fins, with metal and glass filler panels between — all supported on foundations below grade.

On the arena grounds, space will be provided to park 15,000 automobiles. Additional area will be al-

FOAMGLAS®

the cellular, stay-dry insulation

Limestone faced curtain walls of the $10-million, 18-story Labor & Industry Building are hung on a steel grid framework. A backing of moisture-proof FOAMGLAS insures constantly reliable insulation to keep heating—cooling costs down. Incombustible, the insulation provides extra fire protection, too. (Identical curtain wall construction and materials were also used in the 11-story Health and Welfare Building.)

Behind This New Look in Curtain Walls . . .

FOAMGLAS insulation backs limestone faced panels for constant U-value—acts as natural vapor barrier on two Pennsylvania state buildings

Lacy, Atherton & Davis, Architects and Engineers, created a new look in curtain walls for two Commonwealth of Pennsylvania office buildings built by The General State Authority to house the Department of Labor and Industry and the Department of Health and Welfare in Harrisburg. Their curtain design consists of panels of 4″ limestone backed with 2″ of inorganic FOAMGLAS . . . the light yet strong and rigid, all-glass insulation that is its own vapor barrier.

The sealed glass cells of FOAMGLAS are impervious to moisture and vapor. That means there's no moisture absorption to reduce insulating value. Constant U-value is assured . . . for continuing economy in operation of the buildings' year-round air conditioning systems.

FOAMGLAS also insulates the buildings' roofs. There, its unique compressive strength makes it the perfect base for built-up roofing. On both roof and wall panels, important cost savings were possible because FOAMGLAS eliminated the need for separate vapor barriers.

See for yourself why FOAMGLAS is the perfect insulation for *your* designs! Send today for a free sample with directions for six simple tests that clearly demonstrate its unique benefits. Also ask for a 1957 FOAMGLAS Architectural Data Booklet. Write . . .

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Also manufacturers of PC Glass Blocks

Blocks of 2″ FOAMGLAS were applied to backs of limestone panels with 4 gobs of cold setting mastic. A bead of sealing compound on block edges sealed all joints. (In some inaccessible locations, the unique strength and rigidity of FOAMGLAS permitted its installation as a free-standing wall, prior to hanging the limestone facing.) An interior metal lining completed the wall construction.

How to get smooth concrete surfaces at less cost

By simply coating plywood forms with A. C. Horn's Formfilm your contractor can get a finish that eliminates 85% of normal concrete rubbing and cleansing, because Formfilm eliminates grain marks and oil stains. Thus a saving of 10¢ per square foot is possible. (This is based on 50,000 square ft. area of poured concrete.)

You also can save as much as 25% in painting costs on material and labor, because the denser surface accepts paint better. For details on Formfilm see Sweets' Catalog, Construction Materials Section, page 17, or write Dept. H52-4100.

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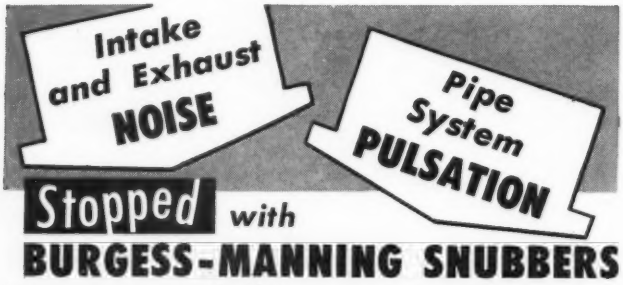

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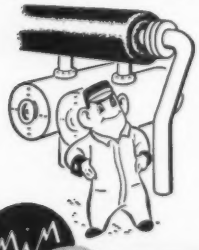
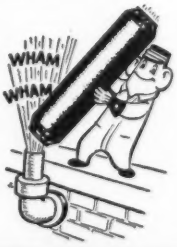
BURGESS-MANNING SNUBBERS

The Burgess-Manning Snubbing Principle has been engineered to effectively eliminate the costly and nerve-racking problem of noise and pulsation. We have, for many years, specialized in the science, cause and effect of noise and pulsation problems. We have adapted the Burgess-Manning Snubbing Principle to many and varied problems in every branch of industry to increase production, minimize maintenance, eliminate this serious source of compensation claims and improve public and employee relations. Burgess-Manning Snubbers are available with such plus features as: air cleaning—or, spark arresting—or, surge control—or, water separating—or, heat recovery.



Let us engineer your noise and pulsation problems right out of existence.

Write for Case Histories.



BURGESS-MANNING COMPANY
Sound Engineering
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Dallas, Texas

lowed for 300 taxis and shelters for loading 120 buses. Parking space for service trucks, service buildings, restaurants, gas stations, dressing rooms, stables, garages, infirmaries, and utilities also are included in the plans.

Mobile sections will permit change of seating arrangements. The tiered seating areas of the club house and grandstand, the standee terrace, and the exhibition hall, will be heated by hot water radiant coils embedded in concrete. Warmed circulating air, which will flow through dampered roof vents, will supplement the radiant heat.

Space beneath the stands, and entrance lobbies, will have mechanical ventilation with filtered and steam heated outdoor air supply.

The cafeteria, lounges, and administration spaces will have mechanical ventilation with filtered heating and ventilating systems.

The judge's stand, patrol judges' booths, radio and television booth, press box, and police booths will be heated by individual steam or electric units, depending upon the distance from the steam plant.

The central heating plant will be located under the stands at the lowest level of the arena. Temperatures and supply and exhaust air will be controlled from a central supervisory board combining electronic and electrical features, or a pneumatic system.

Lighting units will be placed in clusters, mounted on platforms supported from the roof. High wattage mercury-vapor tubes and incandescent downlights will be used. The race track will have adjustable floodlights on platforms accessible either by catwalks or by chairlifts.

NSPE Opposes Proposed Ruling On Hiring of Highway Engineers

At the spring meeting in Charleston, S. C., the board of directors of the National Society of Professional Engineers voted to oppose a recommendation of the U. S. Bureau of Public Roads forbidding consulting engineering firms to engage any professional or technical personnel who are, or have been during the period of a Federal Aid contract, employees of the Bureau, state, county, or city highway departments. The Bureau requested that the clause be placed in state highway construction contracts.

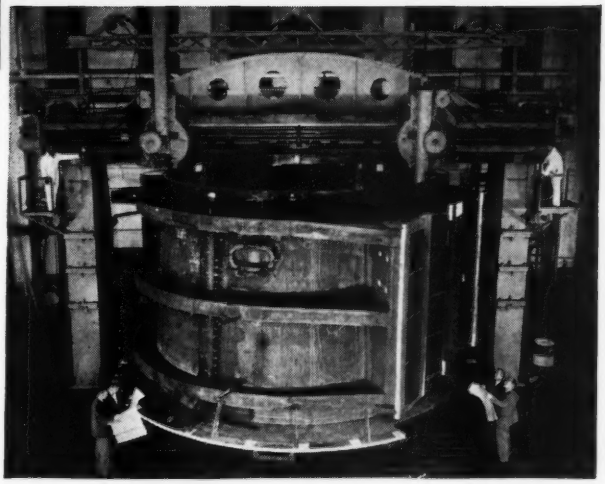
The NSPE Engineering Practices Committee said that such a policy would "freeze highway department employees to their jobs or force them out of the highway program entirely."

International Prestressed Concrete Conference To Be in San Francisco

The International Conference on Prestressed Concrete will be held in San Francisco, July 29 through Aug. 2, at the University of California. An estimated 600 engineers, scientists, architects, contractors, and manufacturers will attend.

The Conference will be sponsored by the University in cooperation with the Prestressed Concrete

Rotor discs for mammoth 11-stage compressor were balanced and stacked for alignment in one of Newport News' five huge machine shops. Large engineering and technical staffs with a vast plant make Newport News an ideal source for large equipment . . . *standard or special in design.*



A 35-foot boring mill in Newport News' plant machining the 374,000-pound upstream housing for the giant axial flow compressor. The compressor is heart of an 8-foot supersonic wind tunnel at the Ames Aeronautical Laboratory of the National Advisory Committee for Aeronautics at Moffett Field, Calif.

To create winds exceeding

2000 MPH

Newport News builds world's Mightiest Compressor

Whenever you want large units built with careful attention to detail, give the job to Newport News.

This company recently built an eleven-stage axial flow compressor that shatters all previous records for wind force . . . using what is believed to be the world's largest rotating object.

The rotor, weighing more than 400 tons, comprises eleven huge discs. Each disc, machined from a 96,000-pound forging, was finished to a 50,000-pound wheel and balanced to within 26 ounces at the rim. In each rim, slots for blades were machined to within .005″ on special milling heads designed and produced in the Newport News plant.

Here at Newport News, you'll find more than large productive capacity. In machine shops, foundries and forging plants Newport News craftsmen complete your orders with specialized techniques backed by experience in fabricating thousands of products.

Newport News' craftsmen produce units that range from small components of spinning machines, to mammoth hydraulic turbines . . . from piping, pumps and valves, to vacuum tanks, digesters and bridge caissons.

These skilled men handle the job exactly as you want it done, for maximum results per dollar invested. So let us bid on your present or future projects. Learn how Newport News can help you. Send for our illustrated booklet entitled, "Facilities and products" . . . it's your for the asking.

Newport News

Shipbuilding and Dry Dock Company

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Interior Fire Protection
involves *more* than most people see . . .

that's why Engineers and Contractors prefer

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Flush-type Siamese—*one of many models*

This time-proved line *more* than meets specifications. It meets the highest standards of safety plus design, practicality and economy.

Write for Allen 150 (A.I.A. file 29e2) and nearby counsel . . .

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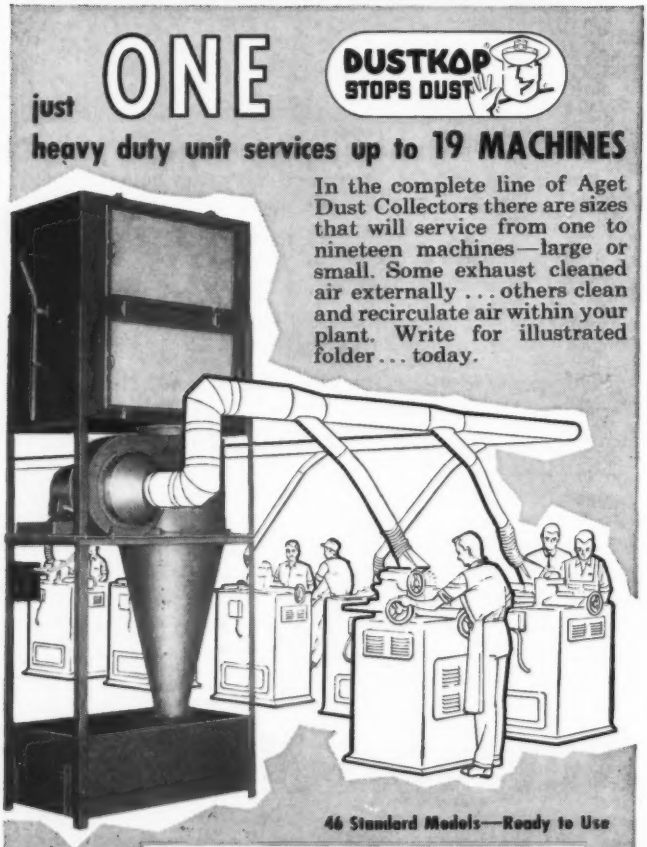
heavy duty unit services up to 19 MACHINES

In the complete line of Aget Dust Collectors there are sizes that will service from one to nineteen machines—large or small. Some exhaust cleaned air externally . . . others clean and recirculate air within your plant. Write for illustrated folder . . . today.



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Institute, the American Society of Civil Engineers, the *International Federation de la Precontrainte,* the American Concrete Institute, and other technical societies. PCI will hold its Third Annual Meeting concurrently with the Conference.

The program will consist of papers on precast prestressed members, prestressed thin shells and slabs, and research, design, and construction in various countries.

Translates Sound Waves Into Underground Photos

A new method of translating sound waves into cross sectional pictures of underground areas is expected to increase chances of discovering oil in undeveloped areas.

Gulf Oil Corp. has announced development of a method to take sound waves, sent underground by seismic prospectors to probe the position of rock strata, and photographically transform them into cross sectional pictures of the underground area. The result is the most detailed and accurate picture of domes, faults, and other structural features ever available from surface observation.

The method has been credited with two oil discoveries in a West Texas area previously thought to be without oil deposits.

Small dynamite charges are used to send sound waves into the rock layers. These sound waves, bouncing back from underground rock, activate tiny electric bulbs that glow with varying intensity according to the echo's duration and strength. This changing pattern of brightness is recorded on moving 70 mm film. Twenty-four "tracks" of light are made lengthwise along each film strip — one for each of the 24 stations picking up explosion echoes.

A profile printer machine overcomes variations occuring between film strips, and it prints each strip on a continuous photographic sheet, creating an integrated cross sectional photograph.

ARTICLE REPRINTS

For free copies of reprints listed below, write on company letterhead to Reader Service Dept., CONSULTING ENGINEER 227 Wayne St., St. Joseph, Mich.

"More Money for Private Enterprise Abroad"
"Gas Turbines in Electric Utility Plants"
"Curricula for Budding Consultants"
"Estimating Drafting Costs"
"Water Treatment in Urban Buildings"
"Precast Concrete Comes of Age"
"Survey of the Profession—1957—Part I"
"Survey of the Profession—1957—Parts II-III"

Men in Engineering

Two Baltimore consulting engineers have been elected to the rank of Fellow of the American Society of Mechanical Engineers: Huldreich Egli of Egli and Gompf, Inc. and James Posey of James Posey and Associates.

George I. Uitti, president and structural engineer of Thomas J. Higgins Associates, Inc., of Chicago, has been elected president of the Michigan College of Mining and Technology Alumni Association.

F. K. Boomhower has retired from the firm of Albert Kahn Associates, Detroit, Mich., after 41 years.

At the 76th Annual Alumni Dinner of the City College of New York, Dr. David B. Steinman was awarded the Centennial Medal "for outstanding devotion and loyalty to the Alumni Association and College."

The use of electronic accounting devices in large-scale tonnage distribution in the package industries was discussed at the Fourth Annual Conference on High Speed Computers by William H. Meserole, president of the Ballinger-Meserole Company, distribution consultants. The conference was held at Louisiana State University, Baton Rouge.

Admiral Robert A. Meade, chief of the Yards and Docks Bureau, was honored at a luncheon of the San Diego Post, Society of American Military Engineers. The admiral is a director of the national society.

Formation of a partnership has been announced by Henry J. Wald and Arthur L. Zigas. The firm, Wald & Zigas, Consulting Engineers, has offices in Long Island City, N. Y.

Foster D. Snell, Inc., New York, a firm of consulting chemists and chemical engineers, has named Richard S. Ringheim as director of marketing and economic research. Ringheim formerly was senior market analyst for Barrett Division of Allied Chemical & Dye Corporation. He also was chemical markets editor of *Chemical Week*.

Ted H. Smith has been promoted to project manager of the electronics division, Designers for Industry, Inc., Cleveland. At present, Smith is developing test equipment for the government's guided missile program.

SMITH WILLEY

Board of directors of the American Society of Lubrication Engineers has appointed Calbert L. Willey as administrative secretary. Willey formerly was assistant to the executive director of the National Society of Professional Engineers.

The American Institute of Electrical Engineers has named 16 engineers and educators as Fellows. Among those honored were Samuel B. Morris, consulting engineer to the Los Angeles Water and Power Department, and Arthur H. Phillips, chief electrical engineer, Gilbert Associates Inc., Reading, Pa. Others are Victor H. Braunig, San Antonio; Volney J. Cissna, Chattanooga; Anatole R. Gruehr, Brooklyn; Thomas J. Higgins, Madison, Wis.; Russell M. Kerchner, Manhattan, Kan.; Clarence H. Linder, New York; Lawrence J. Lunas, Newark, N.J.; Earl F. Mekelburg, Milwaukee; John A. Potts, Milwaukee; Leon T. Rosenberg, Milwaukee; Fred J. Van Zee-

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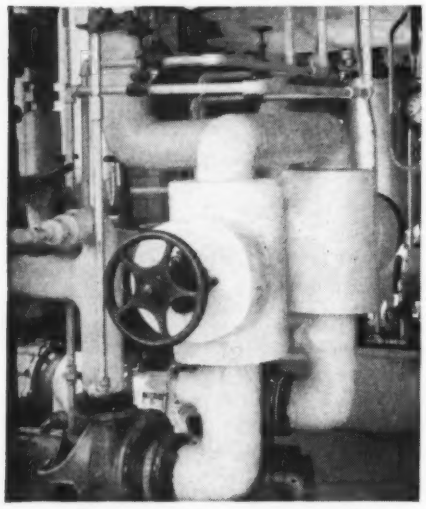

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102ND YEAR

To Serve Your Industry Better

land, Milwaukee; Leroy R. Patterson, Denver; Haakon I. Romnes, New York; and Victor Siegfried, Ashton, R.I.

TAB Engineers Inc., of Chicago, has announced the appointment of two assistant regional sales managers. Lester H. Oliver will have headquarters in Minneapolis. Gordon E. Bratz will have offices in St. Paul.

Cline, Zerkle & Agee, Engineers and Architect of Berkeley, Calif., named C. J. Sly Jr. office manager.

Barton, Stoddard, Smith & Milhollin, Consulting Engineers, has moved to 500 Idaho St., Boise.

Woodward, Clyde & Associates, consulting civil engineering firm in Oakland, Calif., has opened branch offices in Omaha and Kansas City, Mo. Howard M. McMaster, former professor of soil mechanics at the University of Nebraska, is in charge of the Omaha office. Temporary head of the Kansas City office is James L. Sherard, who will return to Denver later this year as resident partner in charge of the Denver, Omaha, and Kansas City offices.

Paul A. Dollard, president of Century Engineers Inc., Burbank, Calif., has announced the election of John F. Taggart as vice president in charge of customer relations.

Thomas W. Hopper has been elected president of Day & Zimmermann Inc., Philadelphia. Hopper, former executive vice-president, succeeds Theodore E. Seelye, who continues as a director and a member of the executive committee.

New officers of the Gulf Institute of Consulting Engineers are: president, Louis N. Goodman; 1st vice president, Leo S. Weil; 2nd vice president, B. M. Dornblatt; secretary-treasurer, George A. Heft. The board of governors is made up of George P. Rice, E. M. Freeman, and William H. Dyer, Jr.

Designers for Industry, Inc., of Cleveland, Ohio, has appointed Walter Hood as project manager of mechanical engineering, and M. L. Snedeker to project manager in the electronics division.

The Mayeron Engineering Co., which recently moved to larger quarters at 1216 Nicollet Ave., Minneapolis, Minn., has appointed Harlan Schmidt as chief engineer and S. D. Olchefeski as manager of the structural and reinforcing detail division.

Maurseth and Howe, consulting soil and foundation engineers of Los Angeles, Calif., have appointed Stanley N. Mitchell as director of all geological and engineering geological activities.

Norman E. Schlenker has been admitted to partnership with M. Russell Turley and William R. Trautman. New name of the firm is Turley, Trautman & Schlenker. Office is at 3026 Genesee St., Buffalo, N. Y.

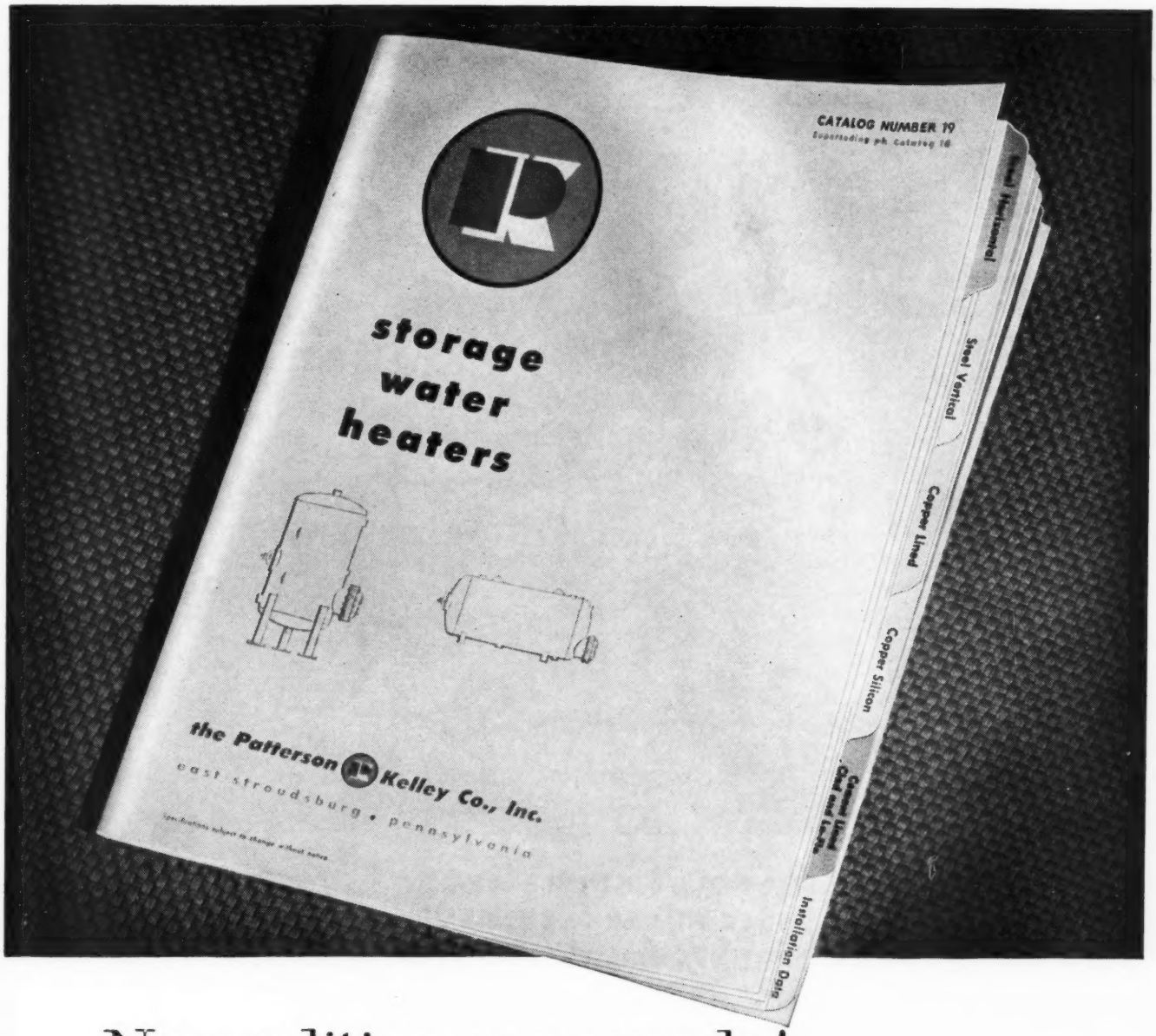
A new engineering firm, Robert J. Freund, Consulting Engineers, opened offices April 1st at 300 West Washington St., Chicago, Ill. Freund was formerly chief engineer for the Premier Electrical Construction Co.

At Bruce Payne & Associates, Westport, Conn., Robert J. Amirault and Thomas E. Flowers, Jr. have joined the firm as senior associates.

In line with its policy to retain the same officers for two consecutive

Mutual Interest

Good lighting principles were discussed before the New York Illuminating Engineering Society by, left to right: Henry J. Wald, consultant; Thomas J. Keegan, architect; M. R. Minto, contractor; Harold Hollowell, distributor; Robert A. Langer, manufacturer.



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The Standard Source of Specification Data for Storage Water Heaters

P-K's new tab indexed catalog has all the information required for architects, consulting engineers and contractors to select and specify storage water heaters. Included are individual sections on plain steel, copper-lined, copper silicon, cement-lined heaters, etc. together with detailed installation data.

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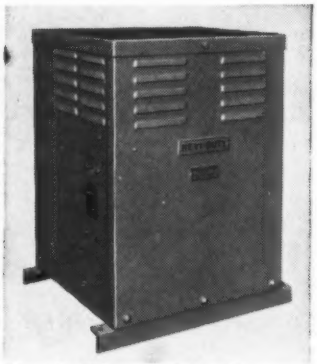
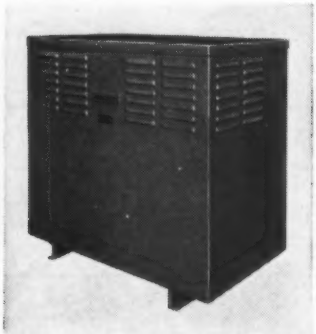


Single-Phase Transformer, with circuit breaker*, for power and lighting loads. Sizes from 5 to 1000 KVA. *Optional



Insulating Transformer for three-phase operation, 480 volt primary; 120/208 volt secondary, 60 cycles. Sizes from 6 to 2000 KVA.

HEVI-DUTY SINGLE AND THREE-PHASE INSULATING TRANSFORMERS ARE . . .

COOL — Have highly efficient chimney-type ventilation system.

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Hevi-Duty Insulating Transformers are available in a wide variety of standard models or may be engineered to your exact specifications. Send for Bulletin 499 or outline your requirements and our engineers will recommend a transformer for you.

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HEAT-TREATING FURNACES, ELECTRIC EXCLUSIVELY
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terms, the Chicago Association of Consulting Engineers has re-elected Charles R. Kuglin as president, E. R. Gritschke as vice president, and Rudolph J. Houkal, Jr., as secretary-treasurer.

Ebasco Services, Inc. has appointed Howard D. Kraft as commercial sales consultant in the company's sales and public relations consulting department.

Earl J. Reeder, a partner in the Miami, Fla., firm of Rader and Associates, has retired. He will continue to act as a consultant to the firm in matters concerning transportation.

Richard A. Matthews has joined the firm of Samuel Moore & Co., Mantua, Ohio, as project engineer. He was formerly vice president of Fenlon, Inc.

Sam P. Turnbull, chief engineer of the Florida State Turnpike Authority, has resigned his post to become engineer-director for the Florida Road Builders Association, Inc. at Tallahassee.

Henry Keyserling and John F. McCabe, Jr. have been elected to partnership in the firm of Cresap, McCormick and Paget.

John J. Constantino has joined the chemical department of Water Service Laboratories, Inc., New York.

Twelve staff members have been made Associates in the Chicago firm of Harza Engineering Co.: Chester E. Bauman, chief electrical engineer; Thaddeus Zowski, chief mechanical engineer; J. W. Dixon, chief hydraulic engineer; Clifford L. Willis, chief geologist; Andrew Eberhardt, chief civil engineer; Donald P. Roberts, project manager and civil department head; Bruce M. Johnson, project manager and civil department head; Franklyn C. Rogers, project manager and civil department head; Kenneth E. Sorensen, project manager and planning department head; E. Pierpont Graham, electrical department head; George B. Schroyer, mechanical department head; and Erik Rettig, resident manager — Karadj Project in Iran. ▲▲

Engineer Available

Will receive B.S. in Civil in June. Top ¼ of class. Have many offers from industry but want job with medium size consulting engineer. Willing to go on board. Anxious to learn. Please write Box 183, Consulting Engineer 227 Wayne St. St. Joseph, Michigan.

*90,000 square feet of "natural" fire insurance covers these Beverly, Ohio, schools**

INCOMBUSTIBLE — Gypsum is the *natural* firefighter ... because it's the rock with a "locked-in", fire-fighting water supply. Gold Bond FIREFIGHTER Roof Deck, poured over Gypsum Formboard such as used on this school job, is usually rated as incombustible *because gypsum won't burn.*

FAST INSTALLATION — Up to 30,000 square feet of Gold Bond FIREFIGHTER Roof Deck can be poured in a single day! Under normal conditions, its quick setting action means that 30 minutes after it's poured the roofer can follow with the built-up roofing, using the poured roof deck *safely* for construction traffic.

Note the construction stages in the picture above. At right, the steel sub-purlins are ready for Gypsum Formboard. At center, the FIREFIGHTER Roof Deck has been poured. At left, the felt and asphalt have been applied and gravel is being spread.

LOW COST — The original building cost is lower—because construction is faster *and* because FIREFIGHTER's low dead loads permits lighter structural supports. Maintenance expense is kept low because gypsum is chemically inert and will not rot, burn or decay. Poured gypsum decks are permanent, yet alterations are easy. Gypsum can be cut, nailed or patched economically.

To see how Gold Bond® FIREFIGHTER® Roof Deck will fit into your plans for pitched, barreled or flat roof designs, write National Gypsum Company, Dept. CE-47, Buffalo 2, New York.

***Beverly Elementary and Fort Frye High Schools,** Beverly, Ohio; *Architect:* McLaughlin and Keil, Lima, Ohio; *Contractor:* Knowlton Construction Co., Bellefontaine, Ohio; *Roof Deck Contractor:* Gypsum Constructors of Ohio, Inc., Cincinnati, Ohio.

"FIREFIGHTER" GYPSUM ROOF DECK

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BUILDING PRODUCTS

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THAN SIMPLY GETTING ATTENTION!

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Here are some of the benefits that companies such as FORD MOTOR, PARKER PEN and CONVAIR get from DuKane:

- **VOICE PAGING**
- **EVACUATION ALARM**
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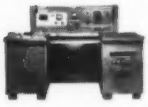
- **WORK MUSIC**

Alert management throughout industry is depending more and more upon DuKane central sound systems for greater efficiency in office and plant operation! DuKane systems may be engineered to any requirement regardless of size and scope of the plant. Sold and serviced by a nationwide organization of experienced engineering distributors. For the cost-saving details fill in and send the coupon today!



Control Console at Parker Pen that operates a multiple bank of high power amplifiers.

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Please send full information on DuKane Central Sound Systems for industry and office

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St. Charles, Illinois

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New Projects Reported

By Consulting Engineers —

ALABAMA

Raymond Strickland and Associates, Birmingham, Ala.
Structural engineering for State of Alabama office building, Montgomery, Ala.

Mosley and Yarbrough, Montgomery. Electrical and mechanical engineering. $2,729,000. Client, T. Cooper Van Antwerp, Mobile, and Charles McCauley, Birmingham, associated architects, and State of Alabama Building Authority.

Trotter-Ernest Engineering Co., Mobile. Two transit sheds at Mobile, Ala., docks for State Docks Dept. Steel frame, steel insulated roof, corrugated siding, rolling doors, concrete slab floor. Wood pile foundations, concrete capped.

Alsey C. Parker & Son, Engineers, Tuscaloosa, Ala.
Collecting sewers and outfall. $1,850,000. Client, City of Tuscaloosa, Ala.

4½ miles 4-lane street widening and improvement. $825,000. Client, City of Tuscaloosa, Ala.

ARIZONA

John E. Stephens & Associates, Phoenix. Municipal building, preliminary studies. $3,500,000. Client, City of Phoenix.

Lentz office building. $750,000. Client, Applewhite Mortgage Co., Phoenix.

ARKANSAS

Harold L. Smith & Assoc., Stuggart. Sewage treatment plant improvements, including sewerage extensions. $410,000. Client, City of West Helena, Ark.

Water supply and distribution system. $65,000. Client, City of Watson, Ark.

Airport, 4000-ft runways and hangars. $96,000. Client, City of Monticello, Ark.

CALIFORNIA

John S. Bates and Roy M. Trotter, Berkeley, Calif.
Sewage treatment plant enlargement, storage reservoir, and dam. $250,000 (est.) Client, City of Lakeport.

Design of sewer system. Report on treatment plant. $200,000 (est.) Client, City of Dunsmuir.

Study of water supply, development of water source, transmission, treatment, and distribution. $1,000,000 (est.) Client, Town of Yreka City.

Cline, Zerkle & Agee, Berkeley, Calif. Showroom and garage buildings, Salinas. $182,000. Client, Cochran Motors.

William H. Kirkgaard, Glendora, Calif. Second floor for film storage building. Hollywood, Calif. $95,000. Client, Hollywood Film Co.

One-quarter mile race track, viewing stands, and accessory buildings. Gardena, Calif. $220,000. Client, Carrel Enterprises, Inc.

H. Emerson Thomas & Associates, Inc., Westfield, N.J.
LP gas-air plant standby to natural gas and fuel supply for fork-lift trucks. Mercury Div., Ford Motor Co., Los Angeles, Calif. $200,000. Client, Ford.

Byrl D. Phelps, San Diego, Calif.
Mission Village, consisting of 2000 new homes, 25-acre shopping site, 3 schools, and 3 church sites. Includes all street improvements, sewer, water, gas, curb, sidewalk, pavement, very wide access roads. $24,000,000. Client, American Housing Guild, San Diego, Calif.

John Sardis & Associates, San Francisco, Calif.
Furniture manufacturing plant, Fremont, Calif. 155,000 sq ft, bi-level reinforced concrete, steel frame, brick walls, steel roof deck, 12-acre site. $2,000,000. Client, Kroehler Mfg. Co., Naperville, Ill.

John D. Swearingen, E.M., Mill Valley, California.
Mine rehabilitation and new plant construction, Eureka quicksilver mine, Sonoma County, Calif. $100,000. Client, Universal Metals Corp. of Nevada.

Mine rehabilitation and new plant construction, Socrates quicksilver mine, Sonoma County, Calif. $75,000. Client, Socrates Mines, Inc.

Clair A. Hill & Associates, Redding. Sewer project. $400,000. Client, City of Redding.

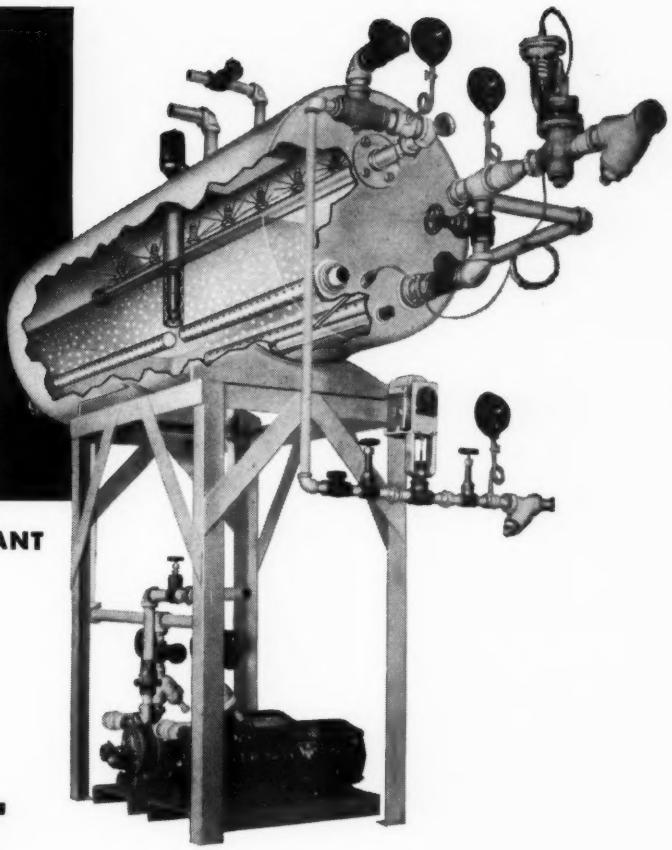
Road project. $250,000. Client, County of Butte.

Building, structures, and access roads. $150,000. Client, Corp of Engineers, U. S. Army.

Senior high school, Enterprise. Structural. Client, Charles Dean, Architect.

Sewer project. $60,000. Client, County of Shasta.

SCHAUB "03" DEAERATOR



FOR THE SMALL TO MEDIUM STEAM PLANT

- **Combats "Return Line" Corrosion**
- **Guarantees Oxygen Removal to .03 cc/liter**
- **Simpler in Principle and Operation**
- **Pays for Itself in Savings**

HOW TO CUT CORROSION COSTS

without Breaking Your Budget

If your steam needs are in the 3,000 to 30,000 lbs./hr. range the Schaub .03 Deaerator was designed with you in mind.

It is in plants of this size range — often operating at low pressure — that "return line" corrosion is most likely to be a continual costly maintenance item. A Schaub .03 Deaerator effectively combats this and at very low cost. It is equally applicable to high pressure installations.

The *big* difference between the Schaub .03 and other low-cost deaerators is that it operates *fully vented* at atmospheric pressure for better gas removal. Yet wasteful steam vapor loss is prevented regardless of load variations by the simple, but effective Schaub spray-contact vent condensing method. Other exclusive features that boost efficiency are pin-point temperature control and "live action" heating of storage water. This provides more forceful "break-away" of air molecules.

With fully vented design, no premium-cost pressure construction is needed and maintenance and operating costs are reduced to a minimum. Rust-proof Chromosoid lining adds years of trouble-free life.

NOTE: For boiler capacities up to 100,000 lbs./hr. and .005 cc/liter oxygen removal, write for Bulletin *575*, describing the unique Schaub Zero-Oxygen Deaerator.

SEND FOR BULLETIN 1300

The full facts on the "hows", "whys" and basic differences in the Schaub .03 method. Filled with facts for the operating or consulting engineer responsible for boiler feedwater deaeration.

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Chicagoan decapitates Mr. Entropy* — stops steam waste with SELECTOTHERM

Around Chicago, Clint Pickett, 2035 Racine Avenue, is famed for eliminating steam waste in schools and other buildings where boilers are used for steam heating.

He does it with SELECTOTHERM, the high-vacuum heating system that automatically provides steam at the proper pressure and temperature for perfect comfort. Installation records show that SELECTOTHERM cuts the fuel bill 19% or more — *enough to pay for the system within five years!*

SELECTOTHERM applies the control directly to the boiler, adds to the effectiveness of unit ventilators and individual room control. Get the whole story. If you're from the Chicago area, call Clint at Illinois Engineering Company (CA 6-6430). If not, write for fact-filled SELECTOTHERM booklet, *Boiler Room Ballad.*

* *Mr. Entropy represents the heat that is produced but unavailable for use.*

SELECTOTHERM
HEATING CONTROL SYSTEM ®

A product of Illinois Engineering Co.
Division of American Air Filter Co., Inc.
2035 South Racine Ave., Chicago 8

COLORADO

Ib Falk Jorgensen, Denver, Colo.
Dormitory, folded-plate concrete roof. Denver University, Denver, Colo. $1,800,000. Client, Edwin A. Francis, Arch.

One-story school addition, concrete beams and joists. Boettcher School, Denver, Colo. $400,000. Client, Edwin A. Francis, Arch.

Chapel. Ft. Lewis A&M, Durango, Colo. $50,000. Client, James M. Hunter, Arch.

Auditorium and museum, Ft. Lewis A&M, Durango, Colo. $200,000. Client, James M. Hunter, Arch.

Concrete girder highway bridge. $80,000. Client, Colorado Highway Dept.

Service station, 3-in. concrete shell hyperbolic paraboloid, 96 x 60 ft, Littleton. $35,000. Client, Kellogg & Sayre.

Slocum & Fuller, New York, N.Y.
Brown Palace Hotel, Denver, Colo. $3,000,000. Client, William Tabler.

Miner and Miner, Consulting Engineers, Inc., Greeley, Colo.
45 miles of 7.2/12.5 kv distribution line system improvements near Sterling and Holyoke, Colo. $80,000. Client, Highline Electric Association, Holyoke.

W. F. Turney and Associates, Santa Fe, N. M.
Airport. $572,000. Client, City of Grand Junction, Colo.

Sewage treatment plant. $800,000. Client, City of Grand Junction, Colo.

Water distribution. $500,000. Client, City of Grand Junction, Colo.

Ken R. White, Denver, Colo.
Martin Mesa Bridge to Mesa County line, Colo. Consisting of 12 miles of uranium access road, 28-ft graded width with 22-ft asphalt surface. Two bridges, one concrete, one steel. $900,000. Client, Colo. State Highway Dept.

Preliminary planning for Naval Air Station, Denver, Colo. Hangar, shop, warehouse, aircraft parking apron, and taxiways. $3,000,000. Client, District Public Works Officer, 9th Naval District, Great Lakes, Ill.

CONNECTICUT

Imlvs C. Hoechel, New Haven, Conn.
Addition and alteration for warehouse and storage, office spaces. Heating and electrical, lighting. $175,000. Client, Porto Construction Co., New Haven, Conn.

Fred S. Dubin Associates, Hartford.
Connecticut Light & Power Co. Plumbing, heating, ventilating, air conditioning, electrical. Litchfield, Conn. $200,000. Client, Leo Caproni Associates, Architects.

Industrial appraisal and plant operation study. Nelson Realty Co., Bridgeport, Conn. Client, State Highway Department, Conn.

Federal housing project, Danielson, Conn. Plumbing, heating, ventilating, electrical. $1,500,000. Client, Arthur Thomas, Architect.

First Baptist Church, West Haven, Conn. Plumbing, heating, ventilating, electrical.

Trinity Episcopal Church. Plumbing, heating, ventilating, electrical. Branford, Conn. $100,000. Client, Painchaud & Ryder, Architects.

FLORIDA

J. E. Curley & Associates, Miami, Fla.
Sea Tower Apartments, Ft. Lauderdale, Fla. Co-op apartments, 84 units, 12 stories. Hot water heating, plumbing, electrical work, air conditioning in penthouses and public spaces, each apartment unit. $1,500,000. Client, Polevitzky, Johnson and Assoc., Arch.

Jack E. Mitchell & Assoc., Coral Gables.
University of Miami Marine Laboratory. Heating, electrical, and plumbing. $200,000. Client, Steward-Skinner & Assoc., Arch.

University of Miami Medical School research laboratory, alteration. Air conditioning, electrical, and plumbing. $90,000. Client, Steward-Skinner & Assoc., Architect.

Holsum Baking Co. office and bank building. Air conditioning, electrical, and plumbing. $500,000. Client, L. B. Taylor, Structural Engineer.

Dade County morgue building. Air conditioning, electrical, and plumbing. $125,000. Client, Steward-Skinner & Assoc., Arch.

Guided missile assembly facility, Cape Canaveral Auxiliary Air Force Base, Patrick Air Force Base, Cocoa, Fla. $2,000,000. Client, Steward-Skinner & Assoc., Arch.

Cerebral Palsy Clinic, air conditioning, electrical, plumbing. $290,000. Client, Steward-Skinner & Assoc., Arch.

Merchantile National Bank of Miami Beach, Fla. 3-story addition. Air conditioning, electrical, plumbing. $600,000. Client, E. T. Reeder & Assoc.

Palm Springs junior high school, heating, electrical, plumbing. $927,000. Client, Steward-Skinner & Assoc., Arch.

Food Fair Supermarket, Key West, Fla. Air conditioning, refrigeration, electrical, plumbing. $300,000. Client, L. B. Taylor, Structural Engineer.

Wolpert-Tilden & Assoc., Orlando, Fla.
Rollins College dormitory, Winter Park, Fla. Complete engineering. $135,000. Client, John Thomas Watson.

Elks B.P.O.E. Lodge, Orlando, Fla. Structural and electrical. $100,000. Client, Hugo R. Broleman.

Robertson warehouse, Orlando, Fla. Structural and electrical. $200,000. Client, Robertson Warehouse Co.

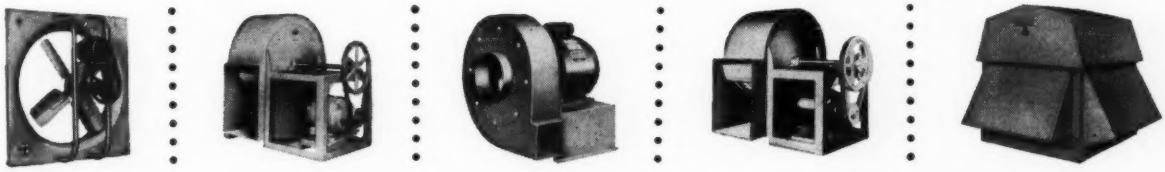
BIG BLOWERS ARE BIG BUSINESS WITH PEERLESS

QUIET! • TROUBLE-FREE! • DEPENDABLE! • HEAVY DUTY! • GUARANTEED!

Versatility in size, application, and engineering has always been a Peerless strong point. Peerless builds its own motors and matches them to the specified blower requirements. Peerless blower frames and housings are usually heavier than any competitive products. Result—a quiet, vibration-free unit.

These are not "off-the-shelf" units, but built to customer rotation and discharge specifications. Each one receives 100% inspection before it leaves the Peerless factory. Each unit is built to NAFM standards. Motors are built to NEMA standards. Each unit is ready for operation when received at the installation site.

A COMPLETE LINE OF AIR MOVING EQUIPMENT



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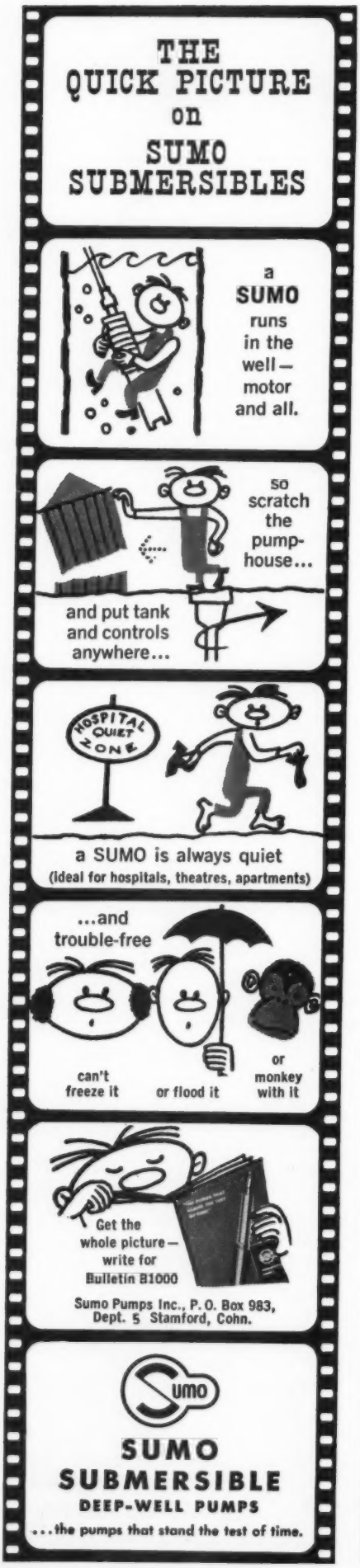

American Building, Orlando, Fla. Air condition existing structure. $120,000. Client, American Fire & Casualty Co.

Office building, Orlando, Fla. Structural design. $200,000. Client, Samuel Ogren.

GEORGIA

John J. Harte Co., Atlanta, Ga.
Dehumidification of existing storage warehouses. $1,000,000. Client, United States Air Force.

IDAHO

Briggs and Associates, Boise, Idaho.
Preliminary surveys, topographical platting, final design, construction plans, and estimates of cost for sidewalks, curbs and gutters, and street storm drains for approx. 70,000 lin ft of streets. $580,000. Client, City of Alameda, Idaho.

Improvement of private water utility, negotiations in progress. $150,000-$250,000 (est.) Client, Malad City, Idaho.

Preliminary engineering, including field surveys and detailed plans for construction of 25 miles of U.S. Highway 30 through Caldwell, Idaho. $250,000. Client, Idaho Department of Highways.

Wendell H. Smith, Preston, Idaho.
New water system. $415,000. Client, City of Jerome, Idaho.

New sewer system and primary treatment plant. $270,000. Client, City of Shoshone, Idaho.

New sewer system and sewage lagoon. $215,000. Client, City of Wendell, Idaho.

Irrigation reservoir, earth fill, capacity 2800 acre feet of water. $60,000. Client, Twin Lakes Canal Co., Preston, Idaho.

Irrigation reservoir, earth fill, capacity 5100 acre feet of water. $400,000. Client, Malad Valley Irrigation Co., Malad.

Toothman, Chronic, and Associates, Boise, Idaho.
Survey and design of 5½ miles highway. Bruneau-Mountain Home, Idaho. $420,000. Client, Idaho Department of Highways.

Survey and design of 15 miles timber access roads. $350,000. Client, U.S. Forest Service.

Preliminary investigation and design for 65,000-acre irrigation project. Elmore and Owyhee Counties. $8,000,000. Client, Crystal Springs Irrigation Co.

ILLINOIS

Miller Engineering Co., Chicago, Ill.
40-story reinforced concrete apartment building, Chicago, Ill.

INDIANA

Hannan, Meek and Cordill, Indianapolis, Ind.
Remodel third floor of Grant County Court House, Marion, Ind. $75,000. Client, Grant County.

Preliminary plans for office and maintenance buildings, Indianapolis, Ind. $110,000. Client, Muesing-Merrick Coal & Oil Co., Inc.

Office building. $20,000. Client, Dr. D. D. Dickson, Greensburg, Ind.

Greensburg First Baptist Church (first unit). $100,000.

H. Emerson Thomas & Associates, Inc., Westfield, N.J.
Propane plant and anhydrous ammonia system. Storage, vaporizers, controls. Indianapolis, Ind. $60,000. Client, Ford Motor Co.

IOWA

Frank L. Pulley, Des Moines, Iowa.
Des Moines Central Y.M.C.A. $2,500,000. Client, Wetherell & Harrison.

Byron Rice School addition, Des Moines. $400,000. Client, Wetherell & Harrison.

Cowles school, Des Moines, Iowa. $200,000. Client, Wetherell & Harrison.

KANSAS

Uri Seiden & Assoc., Kansas City, Mo.
Post office and courthouse, Leavenworth, Kans. $1,000,000. Client, Tewksbury & Assoc., Arch.

LOUISIANA

The Fluor Corp., Ltd., Los Angeles.
Design, engineer, and construct large-capacity electrolytic chlorine-caustic manufacturing plant, near Baton Rouge, La. $20 million (est.) Client, Wyandotte Chemicals Corp.

Day & Zimmermann, Inc., Philadelphia.
Administration building and crafts building, Lake Charles, La. $500,000. Client, Firestone Tire & Rubber Co.

MARYLAND

Henry Adams, Inc., Baltimore, Md.
Edgewood elementary school, Baltimore, Md. Mechanical, electrical installations. $250,000. Client, Cochran, Stephenson and Wing, Arch.

Mercy Hospital addition, Baltimore, Md. Mechanical, electrical installations. $1,000,000. Client, Taylor & Fisher, Arch.

Westview shopping center, Baltimore, Md. Mechanical, electrical installations. $1,500,000. Client, Westview Shopping Center, Inc.

Kluckhuhn, Cobb & McDavid Co., Washington, D.C.
North Hagerstown High School, Hagerstown, Md. Mechanical and electrical. Central heating plant using #6 fuel oil; central air supply systems for cooling and ventilating; 277/480 v, 3-phase, 4-wire electric system; central electronic carrier control system. $3,000,000. Client, architect, McLeod & Ferrara, Washington. D. C.

MASSACHUSETTS

Fred S. Dubin Assoc., Hartford, Conn.
Housing for the aged, 3 units, plumb-

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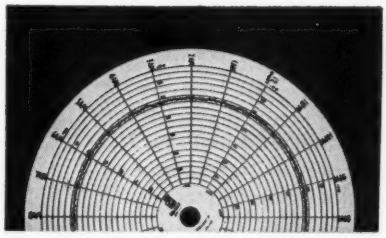
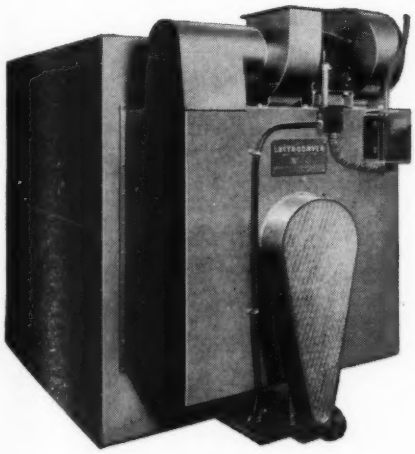
How the weather watcher lost his job

HE KEPT AN EYE on the humidity—said when it would be safe to run and when to shut down. Operations were pretty sketchy during humid summer days, until they discovered that a Lectrodryer makes them independent of the weather. Now they work every day, regardless of the humidity.

Their dewpoint recorder now shows constant DRYness



This is a true story—happened in a candy factory in Chicago. But it's one that's been repeated hundreds of times all over the world—in every type of plant where unwanted moisture is present in air, gases or organic liquids.



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If you're tired of seeing high humidity gum up your production, send for the booklet *Because Moisture Isn't Pink.* It tells how other weather watchers solved their moisture problems. Write Pittsburgh Lectrodryer Division, McGraw-Edison Company, 357 32nd Street, Pittsburgh 30, Pennsylvania.

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1856 10th St., OAKLAND 23, CALIFORNIA

ing, heating, electrical. Leominster, Mass. $300,000. Client, Baker & Dingman, Architects.

Hamilton elementary school. Plumbing, heating and ventilating, electrical. Hamilton, Mass. $750,000. Client, Hugh Stubbins Associates, Architect.

Temple Emanuel. Plumbing, heating, ventilating, air conditioning, electrical. Worcester, Mass. $1,000,000. Client, David Abrahams, Architect.

Newton Synagogue. Plumbing, heating, ventilating, air conditioning, electrical. Newton, Mass. $250,000. Client, The Architects Collaborative.

Boston & Maine R.R. offices. Plumbing, relighting, and new air conditioning system. Boston, Mass. $500,000. Client, Fred Bruck, Architect.

Grafton elementary school, Grafton, Mass. Plumbing, heating, ventilating, electrical. $480,000. Client, Hugh Stubbins Associates, Architects.

Hingham elementary school, Hingham, Mass. Plumbing, heating, electrical, ventilating. $900,000. Client, Hugh Stubbins Associates, Architects.

Elementary school, Hancock, Mass. Plumbing, heating, ventilating, electrical. $120,000. Client, Banker & Dingman, Architect.

Graydon-Smith Products, Inc., West Concord, Mass. Plumbing, heating, ventilating, electrical, air conditioning. $75,000. Client, Edward K. True, Structural Engineer.

Tewksbury elementary school. Plumbing, heating, ventilating, electrical. Tewksbury, Mass. $500,000. Client, Donaldson Roy McMullen, Architect.

Parsons, Brinckerhoff, Hall & Macdonald, New York, N. Y.
Preliminary designs, contract plans, specifications, and supervision of construction of seven bridges and approximately eight separate viaducts, requiring relocation of a portion of Mystic River. $11,000,000 (est.) Client, Northern Expressway, Route 28, Mass.

Master plan of highways for the metropolitan areas of Fitchburg, Leominster, and Gardner, Mass. Client, Department of Public Works.

MICHIGAN

Finkbeiner, Pettis & Strout, Toledo.
Survey and report on water supply system. $1,000,000. Client, Monroe Township, Monroe County, Mich.

Stuart D. Long, Grand Rapids, Mich.
Classroom-education building, Central Michigan College, Mt. Pleasant, Mich. Practice teaching building with eight-classroom elementary one-story wing with all-purpose room and two-story college classroom wing. $1,000,000. Client, Roger Allen & Associates, Arch.

Office building for Muskegon Chamber of Commerce. Fully air conditioned, two stories with meeting room. $100,000. Client, Bernard J. DeVries, Architect.

MINNESOTA

Hitchcock and Estabrook, Minneapolis.
28 sewage treatment plants in Minnesota, South Dakota, Michigan, Iowa, Wisconsin. Combined value, $8,000,000.

Lang and Raugland, Minneapolis, Minn.
Air conditioning system for new wing of Elizabeth Kenny Institute, Minneapolis, Minn. $1,500,000. Client, Kenny Foundation.

G. R. Willet & Co., Chicago, Ill.
Communications and electronics for shopping center, Minneapolis, Minn. Client, Southdale Center, Inc.

MISSISSIPPI

The Austin Co., Cleveland, Ohio.
Chemical plant in Pascagoula, Miss. to produce magnesia and basic refractory products. $8,000,000. Client, H. K. Porter Co., Inc.

MISSOURI

Uri Seiden & Associates, Kansas City.
Women's dormitory #2, Warrensburg. $500,000. Client, Everitt & Keleti, Arch.

Swisser school, Kansas City, Mo. $450,000. Client, Everitt & Keleti, Arch.

NEW JERSEY

Henry J. Campbell, Jr., Mineola, N.Y.
Combined maintenance shop, Camp Kilmer Army Base, N.J. Preliminary plans and specifications for mechanical and electrical facilities. $1,500,000. Client, architects, Raymond & Rado.

Paul K. Gerhardt, Union City, N.J.
Wayne County high school and convent, Wayne Township, N.J. One story high school, auditorium, cafeteria. $1,250,000. Client, Paterson Diocese.

Alteration to department store heating plant. Union City, N.J. $20,000. Client, Holthausen's Department Store.

St. Michaels Hospital, Newark, N.J. New 7-story addition. $1,500,000. Client, Diocese of Newark.

H. G. Metzger Jr. & Associates, Huntingdon Valley, Pa.
Heating, air conditioning, and plumbing services for Tindik residence, Trenton, N.J. $32,000. Client, Franklin B. Spiezle, Arch., Trenton.

Heating, cooling, and plumbing for Helbig residence, Pennington, N.J. $30,000. Client, F. B. Spiezle, Arch., Trenton.

Andre H. Vanderzanden, River Edge.
Structural engineering for elementary school. Timber deck on laminated wood roof beams. Steel pipe columns, reinforced concrete foundation work, including pile caps and grade beams. Building all supported on treated wood piles. River Edge, N.J. $250,000. Client, Gustave Pfost, Arch., River Edge, N.J.

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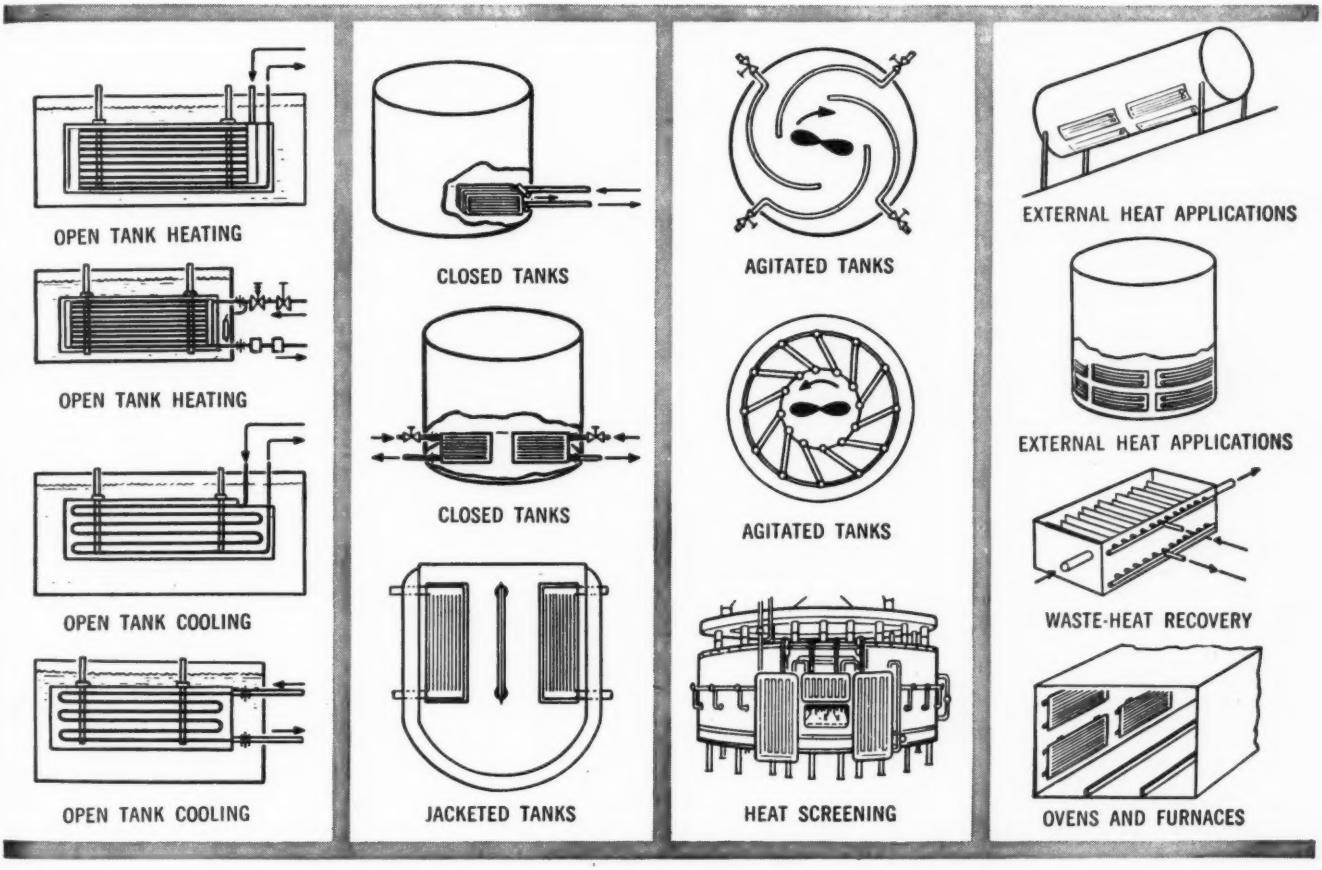
for heating and cooling all types of tanks



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Platecoil simplicity saves engineering, fabricating, installation, operation and maintenance costs in heat transfer.

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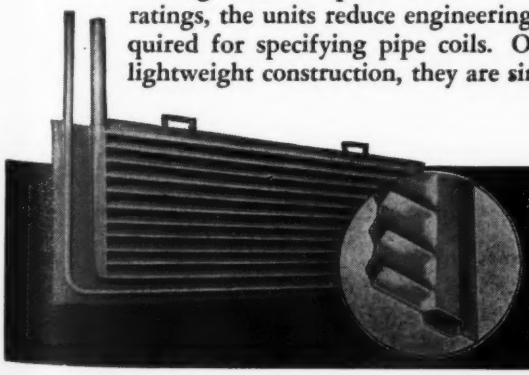

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575,000 gallon capacity, 3" Fir Wood Tank. 70 ft. diameter inside x 20 ft. stave with sloping bottom, downtake, laminated launder, baffle walls and take off boxes. Erected — Celanese Corp. of America, Amcelle, Md.

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NEW MEXICO

Blum & Guerrero, Las Cruces, N.M. First Federal Savings & Loan, Las Vegas, N.M. $200,000. Client, Kern Smith, Arch., Carlsbad, N.M.

Sacramento school, Alamogordo, N.M. $800,000. Client, Walgamood & Millington, Arch., Santa Fe, N.M.

First National Bank, Alamogordo, N.M. $250,000. Client, Carroll & Daueble, Arch., El Paso, Texas.

Dr. Marcello Giomi, P. E., Albuquerque. Santo Domingo elementary school, Santo Domingo. Heating and plumbing. $500,000. Client, Walgamood & Millington.

Bray office building, Albuquerque, N. M. Air conditioning and plumbing. $350,000. Client, Garcia.

Lea County Hospital addition, Hobbs, N. M. Air conditioning and plumbing. $250,000. Client, Graves.

Science, music, and shops buildings, Artesia High School, Artesia, N. M. Heating and air conditioning. $175,000. Client, Vorhees & Standhardt.

Bridgers & Paxton, Albuquerque, N. M. 200-bed hospital, Public Health Service, Gallup, N. M. Client, Flatow, Moore, Bryan & Fairburn, Architects.

Student Union Building, University of New Mexico, Albuquerque, N. M. $2,000,000. Client, Meem, Holien & Buckley, Architects.

Junior High School, Albuquerque, N. M. $350,000. Client, Stanley & Wright, Architects.

W. F. Turney and Associates, Santa Fe, N. M.
Paving. $250,000. Client, Town of Belen.

Water supply. $750,000. Client, U. S. Army, N. M.

Subdivisions, including paving, utilities. $500,000. Client, City of Alamogordo.

NEW YORK

Wesley Bintz, Lansing, Mich.
Swimming pool, Rochester Country Club, Rochester, N.Y. Size, 35 x 75 ft, aluminum. Wading pool, 514 sq ft. Recreation room and bathhouse facilities. $85,000. Client, Rochester Country Club Swimming Pool Committee, Rochester, N.Y.

Henry J. Campbell, Jr., Mineola, N.Y. Swimming pool and bathhouse, Village of Garden City, N.Y. Floodlighting and electrical systems. $300,000. Client, architects, Watterson & Watson.

KLM ticket facilities, Idlewild Airport, N.Y. Design of lighting and electrical work. $400,000. Client, architects, Raymond & Rado.

Shopping center, Freeport, N.Y. Design of heating, ventilating, air conditioning, sanitary, and electrical systems. $400,000. Client, Henry W. Johanson, Arch.

Maintenance shop, Army terminal, Brooklyn, N.Y. Preparation of preliminary plans and specifications for mechanical and electrical facilities. $500,000. Client, architect, Raymond & Rado.

First Presbyterian Church, Southhampton, N.Y. Chapel, Sunday school, administration. Design of heating, ventilating, electrical and sanitary systems. $250,000. Client, architects, Merrill & Holmgren.

Study of building code and recommendations for revisions of sections pertaining to light, ventilation, and mechanical equipment. Client, Garden City, N.Y.

Charles H. Pratt, Syracuse, N.Y.
Water mains, pump station, elevated storage tank, and building. $310,000. Client, Town of Anondaga.

Paul K. Gerhardt, Union City, N.J.
Alteration to Mount Carmel rectory. Present 3-story building enlarged and raised to four stories and basement. Bronx, N.Y. $200,000. Client, New York Diocese.

6-story 200-bed hospital for Doctors' Hospital of the Bronx. Three stories and basement to be built now. Three future stories. Bronx, N.Y. $1,000,000. Client, Doctors' Hospital Corp.

Slocum & Fuller, New York, N.Y.
Pennsylvania Railroad Station, New York. Alterations and concession areas. $2,000,000. Client, Lester C. Tichy, Arch.

Pepsi-Cola Co. home office, New York, N.Y. $5,000,000. Client, Skidmore, Owings & Merrill.

Staten Island, N.Y., shopping center. $3,500,000. Client, Victor Gruen.

Herman Kron, New York, N. Y.
1-story brick service building for proposed gasoline station. 68 ft 6 in. x 30 ft. Building to be provided with overhead oil-fired heat. Farmingdale, Long Island, N. Y. $20,000. Client, L. B. Oil Co., Inc., New York, N. Y.

Fred S. Dubin Assoc., Hartford, Conn. Fifth Avenue Synagogue, New York City. Plumbing, heating, ventilating, air conditioning. $1,000,000. Client, Percival Goodman, Architect.

Camp Hero Air Force Base, Long Island City, N. Y. Plumbing, heating, ventilating, electrical, sewage disposal system. $1,000,000. Client, Sirof & Rosenberg, Architects.

Howard Johnson Motor Lodge, Huntington, L. I. Plumbing, heating, ventilating, air conditioning, swimming pool. $350,000. Client, Carl Koch Associates, Architects.

Utica Civic Auditorium, Utica, N. Y. Plumbing, heating, ventilating, electrical, air conditioning, skating rink, kitchen. $3.500,000. Client, Gehron & Seltzer, Architect.

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Custom heating need not be expensive — the Webster way. The Warren Webster Man has facts and figures to show you how Custom Webster Walvector is being used by architects and engineers . . . often with substantial savings in construction costs.

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When you are faced with the problem of protecting piping underground in highly corrosive soils, a high quality coal tar coating such as called for in AWWA Specifications C-203 and C-204 is normally hot applied at a pipe coating mill. However, in many cases, the volume of pipe does not warrant this expense or the coating mill is too far away to justify the time involved.

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Because TAPECOAT provides a coal tar coating equivalent in long-life protection to hot-applied coating at the mill, engineers are specifying this quality alternate material where time and cost factors preclude mill application.

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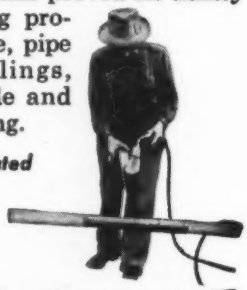
TAPECOAT comes in handy rolls of 2", 3", 4", 6", 18" and 24" widths. Since 1941, it has proved its ability to give lasting protection to pipe, pipe joints, couplings, conduit, cable and insulated piping.



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Evanston, Illinois

Deer Park, L. I., N. Y. Engine test cells. Client, Fordyce & Hamby, Architect.

OHIO

Finkbeiner, Pettis & Strout, Toledo. Survey and report on water supply and sewerage for City of Toledo and County of Lucas, Ohio. $5,000,000 to $10,000,000 (est.). Client, City of Toledo, County of Lucas.

Intercepting sewers and sewage treatment. $725,000. Client, Village of Perrysburg, Ohio.

William Schuller, Toledo, Ohio.
Elmhurst school, 18 classrooms and auditorium-gym. $678,000. Client, Hahn & Hayes, Arch.

H. Emerson Thomas & Associates, Inc., Westfield, N.J.
Propane gas plant. Supply of fuel to LP gas-fired fork-lift trucks. Twinsburg. $40,000. Client, Chrysler Corp.

OREGON

Cornell, Howland, Hayes & Merryfield, Corvallis, Ore.
Design of substation additions, Springfield, Ore. $200,000 (est.) Client, Bonneville Power Admin.

Planning new townsite, Boardman, Ore. Client, Corps of Engineers.

Design of pumping station and chemical feed facilities. Corvallis, Ore. $395,000 (est.) Client, City of Corvallis, Ore.

Design of plant and interceptor sewer, Roseburg. Ore. $1,000,000. Client, City of Roseburg, Ore.

Design of additions to sewage treatment plant and sewer system. Tillamook, Ore. $250,000. Client, City of Tillamook, Ore.

Design of 1957 street paving program, Baker, Ore. $350,000. Client, City of Baker, Ore.

PENNSYLVANIA

Henry Adams, Inc., Baltimore, Md.
Lancaster General Hospital addition, Lancaster, Pa. Mechanical, electrical installations. $500,000. Client, James R. Edmunds, Jr., Arch.

Michael Baker Jr., Inc., Rochester, Pa.
Monongahela River Terminals Corp., Bunola, Pa. Design 1065-ft dock. Client, Dravo Corp., Pittsburgh, Pa.

William R. Jahnke, Pittsburgh, Pa.
Bethlehem joint junior-senior high school, Washington, Pa. Heating, plumbing, electrical. $2,000,000. Client, Howard & Murphy, Arch.

Two 12-story buildings for Pittsburgh Housing Authority. $1,500,000. Client, Corry-Martin, Arch.

New laboratory building, Pittsburgh Consolidated Coal Co. Heating, plumbing, electrical. $200,000. Client, Alan Albig, Arch.

Air condition existing office building, Pittsburgh Coke & Chemical Co. $60,000. Client, Pitts. Coke & Chemical Co.

Sewickley Christian Church. Heating, plumbing, electrical. $250,000. Client, Larry Wolfe, Arch.

Mast Engineering Co., Inc., Reading, Pa.
Sewage treatment plant, Reading, Pa. $4,500,000. Client, Reading, Pa.

Sewerage system. $1,500,000. Client, Spring Township.

H. G. Metzger Jr. & Associates, Huntingdon Valley, Pa.
Falls Township elementary school, Levittown, Pa. Heating, ventilating, plumbing, and electrical services for 10-room, single story building. $160,000. Client, Bellante & Clauss, Architects & Engineers, Philadelphia-Scranton, Pa.

Albert E. Peters Associates, Scranton.
Junior-senior high school building, Mountain View High School, Susquehanna County, Pa. $1,250,000. Client, Emerson C. Willson, Arch.

Shamokin State Hospital, Shamokin, Pa. New heating system. $85,000. Client, Commonwealth of Pennsylvania.

Parros & Pelley, Pittsburgh, Pa.
Rockwood Joint School Board secondary school, Somerset County, Pa. $1,000,000. Client, Gordon Pierce, Architect, Greensburg, Pa.

Slippery Rock high school, Slippery Rock area, Pa. $2,300,000. Client, W. G. Eckles Co., Architects, New Castle, Pa.

Torresdale filtration plant, Philadelphia, Pa. $20,000,000. Client, Morris Knowles, Inc., Consulting Engineers, Pittsburgh.

RHODE ISLAND

Castellucci & Galli, Inc., Pawtucket.
Renovation of club rooms, Providence. $6,000. Client, Aurora Civic Assoc.

Automobile showroom, Providence, R. I. $75,000. Client, Harris Auto Sales.

New commercial building, Providence, R. I. $150,000. Client, Imperial Realty Co.

Repairs and alterations to six schools, Lincoln, R. I. $15,000. Client, Lincoln.

SOUTH DAKOTA

Ray L. Roby, Mitchell, S.D.
Mechanical engineer for South Junior High School, Rapid City. $1,200,000. Client, Ewing & Forrett, Arch.

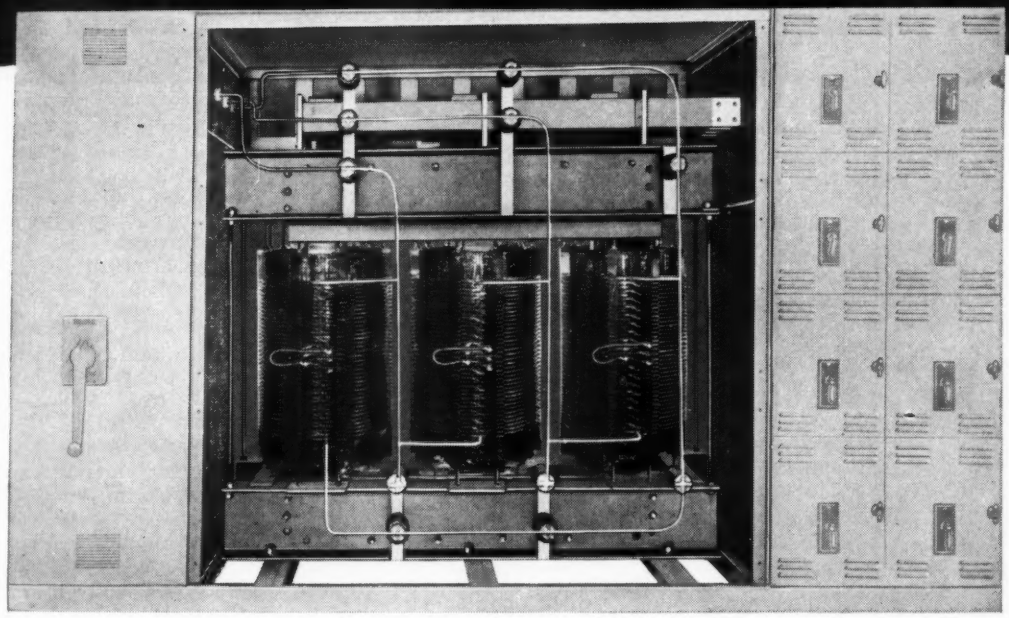
Mechanical engineering for new high school, Pollock, S.D. $400,000. Client, Herges & Kirchgasler, Arch.

Central heating plant addition at Southern State Teachers College, Springfield, S.D. New boiler and stokers. $47,000. Client, Dean W. Loucks, State Engineer.

TEXAS

Blum & Guerrero, Austin, Texas.
Synthetic trainer building, U.S.N.,

THE transformer is the heart OF A SUBSTATION



1000 Kva 13,200 volt Sorgel dry-type transformer in a substation—Compartment panel removed

A substation is no better than its transformer; therefore, it is important that the transformer is the best quality and dependable — a SORGEL transformer.

Quiet operation. The sound level of SORGEL dry-type transformers is well below the established standards. Adaptable for any indoor installation, especially where sound level is an important factor.

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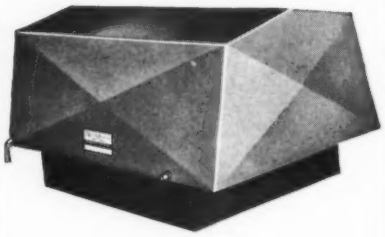

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Kingsville, Tex. $600,000. Client, Jessen, Jessen, Milhouse & Greeuen, Arch.

Texas State School, Austin, Tex. $500,000. Client, Fehr & Granger, Arch.

First Christian Church, Arlington, Tex. $200,000. Client, Fisher & Jarvis, Arch., Dallas, Tex.

Texas State School, Mexia, Tex. $300,000. Client, Thomas, Jameson & Merrill, Arch., Dallas, Tex.

Wilson N. Jones Hospital, Sherman, Tex. $600,000. Client, O'Connell & Probst, Arch., Austin, Tex.

Improvement and additions, El Paso International Airport. $600,000. Client, Garland & Hillis, Arch., El Paso.

Air condition existing First National Building. $250,000. Client, The Bucher Corp., El Paso.

Library building ($400,000) and science building ($450,000), Victoria College, Victoria, Texas. Mechanical and electrical engineering. Client, Ault & Rick, Arch., Victoria.

Tatum and Quade, Dallas, Texas.
Big Town Shopping Center on U. S. Highway 80, east of Buckner Blvd., Dallas County. Civil, structural, mechanical, and electrical, $405,000, $2,500,000, $800,000, and $600,000 respectively. Client, The Big Town Co.

Forrest and Cotton, Dallas, Texas.
Water supply, impounding dam and reservoir or pumping from Iron Bridge Reservoir on Sabine River. $2,000,000. Client, City of Greenville, Texas.

Emergency pump station, Gainesville, Texas. $450,000. Client, City of Dallas.

Dallas east side water treatment plant, 50 mgd nominal capacity. $4,500,000. Client, City of Dallas, Texas.

Water supply, Sabine River or North Texas Municipal Water District, Terrell, Texas. $1,200,000. Client, City of Terrell, Texas.

Crosswind runway and taxiway, U. S. Naval Landing Field, Alice Orange Grove, Texas. $2,049,000. Client, U. S. Navy, Eighth Naval District.

Strengthening airfield pavements, U. S. Naval Air Station, Dallas, Texas. $1,700,000. Client, U. S. Navy, Eighth Naval District.

Runway, taxiways, and apron, Sheppard Air Force Base, Wichita Falls, Texas. $13,100,000. Client, Corps of Engineers, U. S. Army, Tulsa District.

American Airlines site development, Love Field, Dallas, Texas. $700,000. Client, American Airlines.

Water supply and sewage treatment improvements and additions. $2,300,000. Client, City of Paris, Texas.

VIRGINIA

Andre Merle Assoc., Alexandria, Va.
Air-conditioned, modern two-story shopping center, Annandale, Va. Mechanical and electrical. $3,500,000. Client, Noakes & Neubauer, Arch.

WASHINGTON

Cornell, Howland, Hayes & Merryfield, Corvallis, Ore.
Design of sewers and pumping station, Pasco, Wash. $260,000 (est.) Client, City of Pasco, Wash.

W. C. Nickum and Sons, Seattle, Wash.
Concrete and structural steel addition to present facilities of Air Reduction Pacific Co. plant, Seattle, Wash.

FOREIGN

H. K. Ferguson Co., Cleveland, Ohio.
Procter and Gamble plant, Malines, Belgium. Consultants formed Belgian subsidiary for project. Plant includes water tower, boiler plant, warehouse, main factory, and administration building. $4,000,000. Client, Procter and Gamble Co.

Fluor Corporation Ltd., Los Angeles.
Additional engineering, procurement, and construction of offsite facilities for expansion. $4,000,000. Client, British American Oil Co., Clarkson, Ont.

Jack E. Mitchell & Assoc., Coral Gables.
Sports Palace. Air conditioning. Havana, Cuba. $675,000. Client, Arroyo & Menendez, Arch., Havana, Cuba.

Robert H. Bennett, Puerto Rico.
General specifications publication for the Dept. of Public Works, Puerto Rico.

William R. Jahnke, Pittsburgh, Pa.
Sunbeam Electric Co. factory, San Juan, Puerto Rico. Electrical and air conditioning. $300,000. Client, Schmidt & McDade, Arch.

The Fluor Corp. of Canada, Ltd.
Procure, engineer, and install first phase of piping for new Boundary Dam generating station, at Estevan, Sask. $600,000 (est.) Client, Saskatchewan Power Corp.

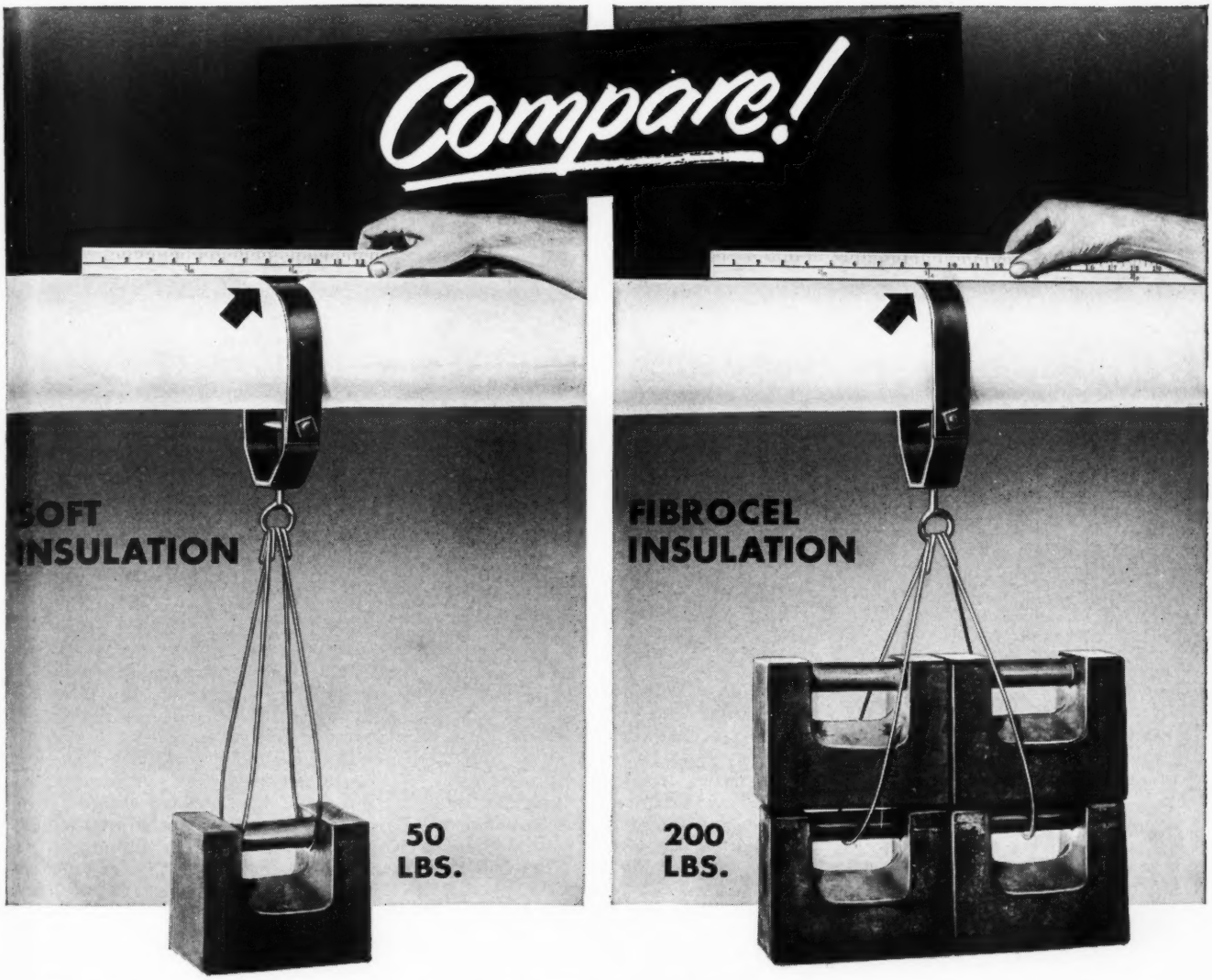
G. B. Gusrae, New York, N. Y.
Duppy Farm Hotel, Jamaica, B.W.I. New elevator installation. $100,000. Client, Wm. F. R. Ballard, Architect.

M. N. Dastur & Co. Private Ltd., Calcutta, India.
Design, engineer, and construct complete 30,000-tons-per-year ferromanganese plant (2-9000 kva ELKEM rotating furnaces). $3,000,000. Client, Tata Iron & Steel Co. Ltd., Jamshedpur, India.

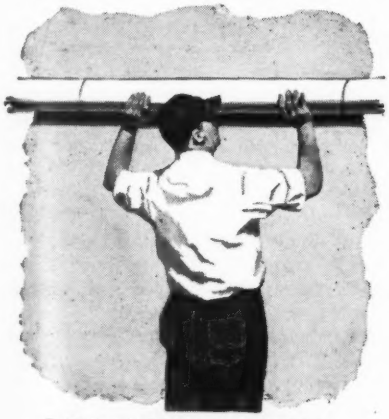
Engineering studies and preliminary plans for expansion of steel melting and rolling mill facilities for Mukand Iron & Steel Works Ltd., Bombay, India.

Henry F. Teichmann, Inc., Pittsburgh, Pa.
Furnace construction supervision, operating staff, and professional services for operating the Korean Flat Glass Plant, Inchon, Korea. $180,000. Client, Vinnell Co., Inc., Alhambra, Calif.

Consulting services for plant equipment and product development. Client, Della Fidenza, S.A., Vetraria, Milano, Italy.



Compression test proves J-M Fibrocel® insulation retains *FULL-WALL* thickness!



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the new molded silica insulation developed for plumbing, heating, chilled water and dual service applications in the 35F to 300F temperature range

The illustrations tell you why Fibrocel maintains its insulating effectiveness . . . why it stands up under operating abuse which often impairs the performance of softer insulations.

At top left, a *single* 50-lb. weight noticeably crushes the soft ordinary insulation. But note that *four* of these same weights cause no deformation or compression in Fibrocel. *This means full insulating effectiveness!*

Fibrocel's added firmness and strength take on even more importance when a vapor seal jacket is involved. For Fibrocel offers substantially greater back-up protection against jacket punctures.

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For further information on Fibrocel, write Johns-Manville, Box 14, New York 16, N. Y. (In Canada, Port Credit, Ontario.) Ask for brochure IN-155A.

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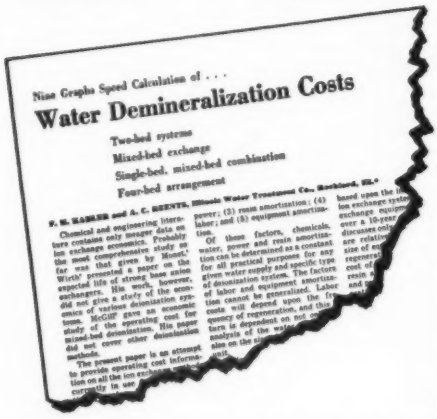
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Books

For

Consulting Engineers

THERMAL POWER FROM NUCLEAR REACTORS, by A. Stanley Thompson and Oliver E. Rodgers; John Wiley and Sons, Inc.; Chapman and Hall Limited; 223 pp; $7.25.

Reviewed by V. C. Lundquist
Principal Mechanical Engineer
Ralph D. Thomas and
Associates, Inc.

The co-authors of this book are two men who both have an impressive background in the nuclear energy field, and who are currently associated with the Studebaker-Packard Corp. The volume deals with the application of nuclear reactors to the production of thermal power, primarily from the mechanical engineer's viewpoint.

In addition to devoting considerable space to the general description of nuclear reactors, the book presents a thorough review of nuclear fission in a manner which is designed to give the physicist an insight into the engineering implications associated with the release of atomic energy.

The objective of the book is to present the following:

¶ Nuclear considerations, including description of atoms, stable and unstable elements, bombardment of nuclei by particles, inelastic neutron processes, and breeding.

¶ Reactor equations and critical mass, including conservation of neutrons, leakage, absorptions, and dimensional analysis.

¶ Reactor kinetics and reactor shielding.

¶ Reactor materials and thermal stresses.

¶ Power extraction from reactors and thermal power cycles.

Although the book requires the use of terms and concepts unfamiliar to persons not directly concerned with the field of nuclear energy, the authors have kept this in mind and have sought to begin each discussion on a level that is common to all branches of engineering. As a result, the volume is very readable to anyone who has an engineering background. The book is well organized, and contains adequate illustrative examples that are helpful in giving the reader a better understanding of the problems involved in the development of nuclear reactors for the generation of mechanical or electrical power.

The book contains eight chapters, an index, and a list of symbols. Accompanying each chapter is a bibliographic list of important reference literature which will no doubt prove very useful to any one who wishes to study more fully the various problems discussed. Accompanying the discussion of each chapter is, of course, a very complete mathematical analysis covering, among others, such considerations as nuclear reactions, diffusion, heat transfer, and thermal stresses.

The authors recognize certain problems in writing a book in so new a field as nuclear engineering. One of the first of these problems is the non-uniformity of the nomenclature and terminology used by various groups in the atomic energy field. Another problem is, of course, the matter of security regulations which prevent the presentation of specific properties of certain materials and such other data as is classified "secret." Then too, some current methods of procedure and calculations are recognized as being subject to revisions and these will be superseded by more adequate and manageable ones as experimental work progresses.

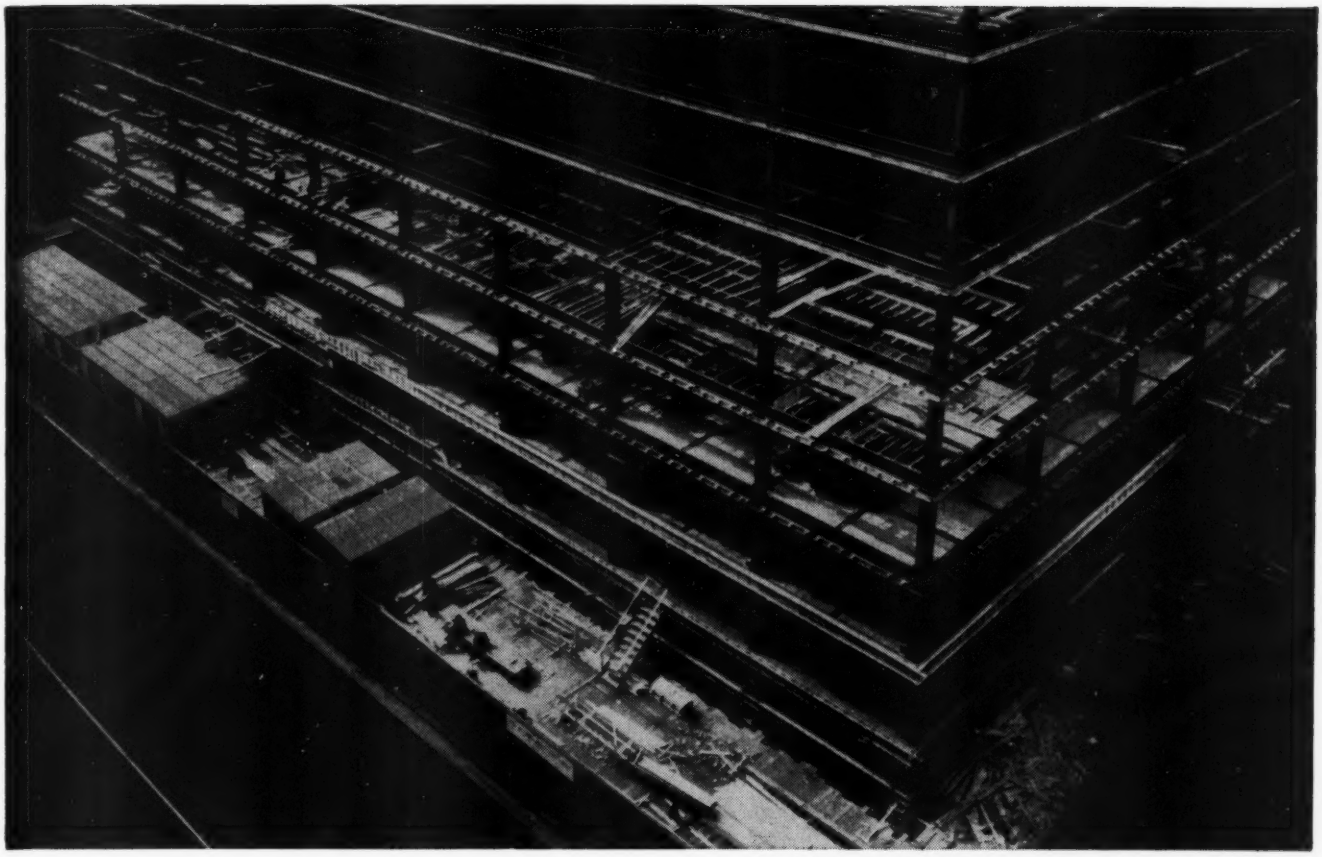
This book is a very worthy supplement to the library of any engineer or physicist who is interested in possible peacetime uses of atomic energy for power purposes.

•

AMERICAN CIVIL ENGINEERING PRACTICE, Vol. II, Edited by Robert W. Abbett; John Wiley & Sons, Inc.; 917 pp.; $15.00.

Reviewed by
Liberato Daniel D'Addona
McNamee, Porter and Seeley

This book is the second of a three volume series covering American civil engineering practice. Volume I



All-Welded Framework *for 26-story Bank of New York Building*

Welded design for 26-story framework selected for economy

ALTHOUGH originally designed for riveting, the bid for this 6000 ton Bank of New York Building framework was let for a welded design. Comparisons in steel requirements and construction costs were primary factors in deciding upon welded design. For extra speed in fabrication and erection, connections were designed to make maximum use of fast down-hand welding. Structural work was by the Dreier Structural Steel Co., Inc. of Long Island City using Lincoln "Fleetweld 5" and "Fleetweld 7" electrodes; design was by Voorhees, Walker, Smith and Smith, architects and engineers.

Similar benefits through welding can be duplicated on essentially every type of building and bridge. Write Lincoln for application information.

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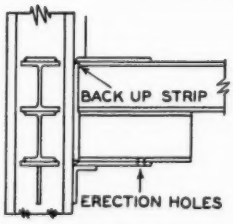
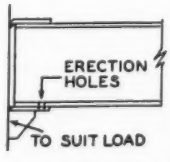


W-1 Type Wind Connection 12 WF.



W-5 Type Wind Connection 12 & 14 WF.

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Volume II is devoted to the general fields of hydraulics, sanitary, and harbor engineering. These books will be a great addition to consulting engineering libraries and will no doubt see much use. Top men in the field have written each section.

The section headings covered are: Hydraulics, Pumping, Hydraulogy; Dams; River Engineering; Hydroelectric Power; Irrigation and Land Drainage; Public Water Supply; Sewerage and Sewage Disposal; Refuse Collection and Disposal; and Harbor Engineering.

The sections are very well written, easily read, and well arranged. Some sections are possibly not as complete as one would hope.

Volume III, devoted to masonry, reinforced concrete, steel, and timber structures, will be covered in a future review.

ALSO AVAILABLE

HYDRAULICS REFRESHER FOR PROFESSIONAL ENGINEERS' LICENSE, by John D. Constance, P.E.; DeTroy Press, Inc.; paperbound; $3.00.

This second edition contains a completely new section on equivalent pipes and loop flow distribution with selection curves. It also gives relative carrying capacities of pipelines of equal smoothness and instructions on how to determine the number of branch pipes a header can normally accommodate.

•

REACTORS, Series II, Vol. 1, edited by R. A. Charpie; McGraw-Hill Book Co., Inc.; 492 pp.; $14.00.

A series of review papers on the present state of the reactor physics, it includes information on the design and operating characteristics of the important research reactors throughout the world, including the Soviet Union. Each nation's power reactor program also is summarized individually.

•

INVENTORS AND INVENTIONS, by C. D. Tuska; McGraw-Hill Book Co., Inc.; 135 pp.; $3.75.

Information on the psychology and methods of invention, and suggestions on protection, patent procedures, and marketing methods are included. Outstanding inventions are explored by the case history approach, and examples are given of several types of inventions produced by various means.

•

UNFIRED PRESSURE VESSEL CODE SIMPLIFIED, by Robert Chuse; 30 pp.; $6.50.

An analysis of the 1956 ASME Code, the book contains simplified charts for internal and external pressure, shell thickness, flanged and dished head thickness, flat head thickness, flat cover plate thickness, openings, and reinforcements.

•

PROCEEDINGS OF THE WORLD CONFERENCE ON EARTHQUAKE ENGINEERING; Earthquake Engineering Institute; paper bound; $8.50.

This volume is made up of reprints of papers presented at the 1956 conference. Subjects are broken down into five categories: Earthquake Ground Motions; Analysis of Structural Response; Development

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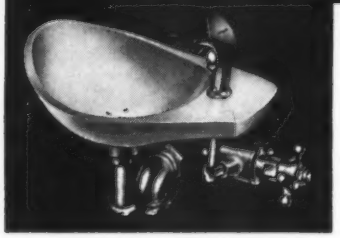

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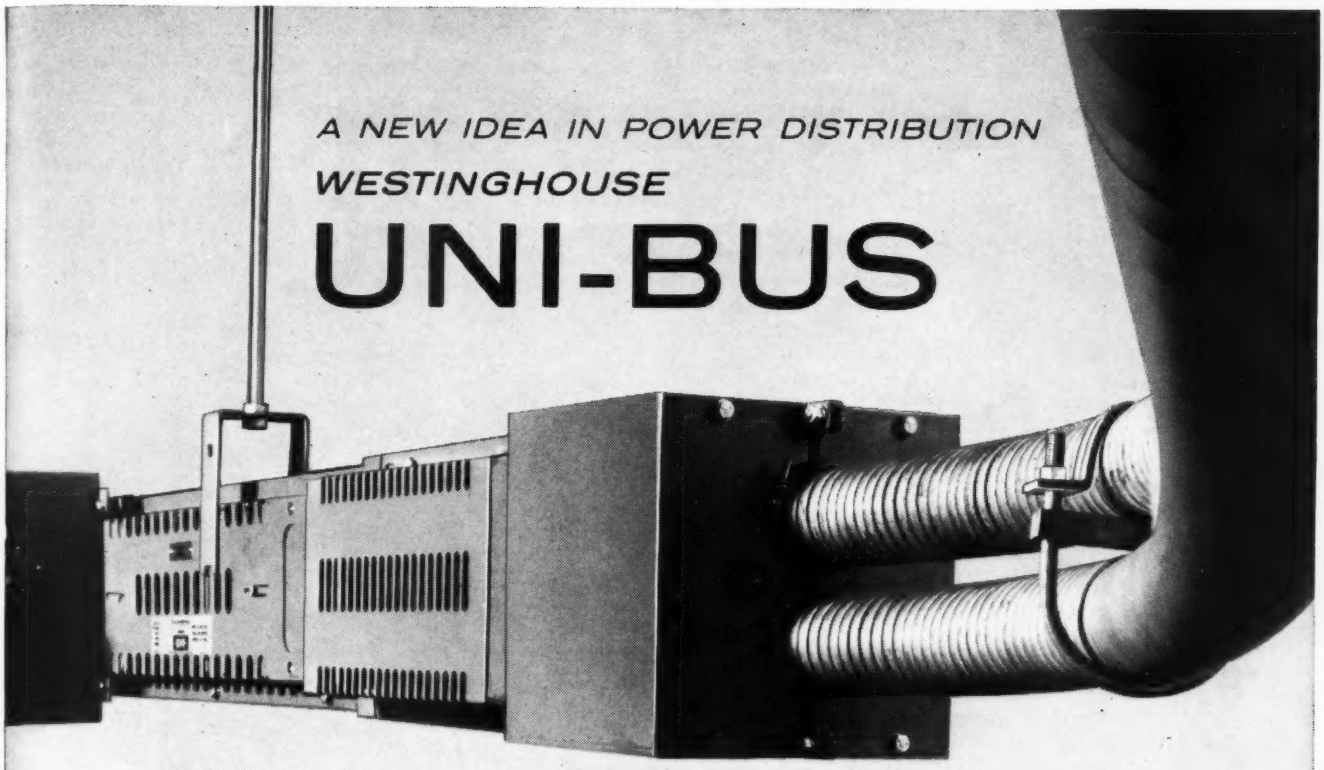

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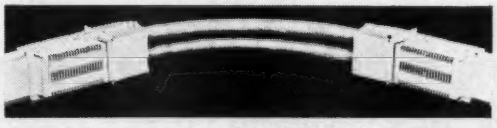

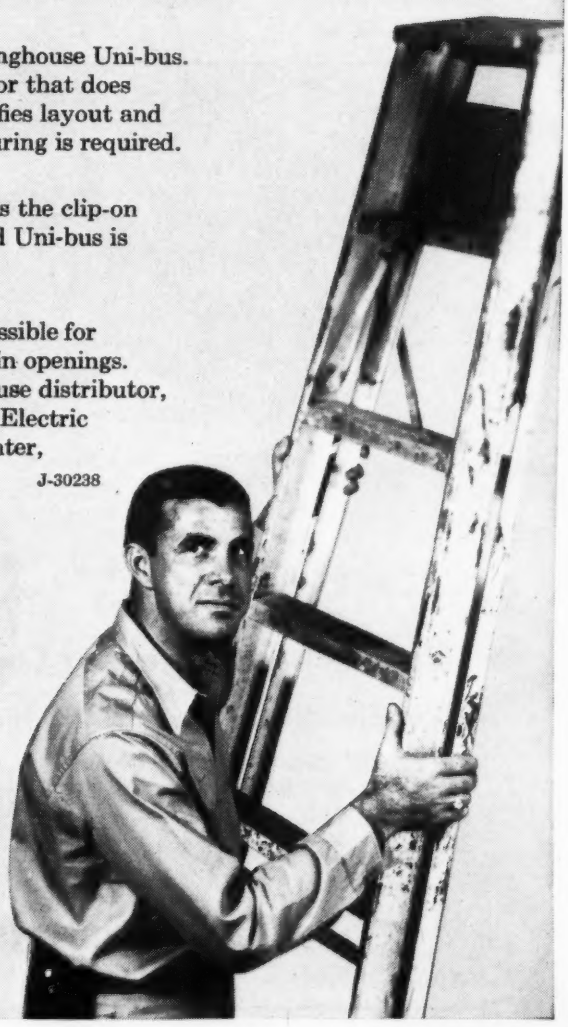

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VIBRATION ANALYSIS TABLES, by R. E. D. Bishop and D. C. Johnson; New York: Cambridge University Press; 59 pp., paperbound; $2.00.

CONTRACTS, SPECIFICATIONS, AND ENGINEERING RELATIONS, 3rd Ed., by Daniel W. Mead; McGraw-Hill Book Co., Inc.; 427 pp.; $7.00.

This book explains the engineer's rights, responsibilities, and relations to his associates. Such topics as the engineer as an arbiter, agent, and participant in legal proceedings are covered. Construction by direct employment and by contract, types of cost-plus provisions, advertising and letting of contracts, general conditions, and other related subjects are discussed. The book also presents the complete specifications for a large engineering job.

•

ELECTRIC POWER DISTRIBUTION FOR INDUSTRIAL PLANTS; AIEE No. 952; 172 pp.; $3.50. ($1.75 to AIEE members.)

GROUNDING OF INDUSTRIAL POWER SYSTEMS; AIEE No. 953; 40 pp.; $1.20. (60¢ to AIEE members).

The first of these books is a revision of the 1945 edition, popularly known as the "Red Book." The second book is an extension of chapter five of the first book. Both are available from the American Institute of Electrical Engineers, 33 West 39th St., New York 18, N. Y.

•

ENGINEERING REGISTRATION EXAMINATION, by August E. Waegemann; 381 pp.; $7.00.

This book covers examinations given by the State of California for the registration of civil engineers and engineers in training. Examinations given between 1940 and July 1949 include unofficial solutions of the problems by the author. Examinations given up to June 1956 include the problems only.

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SECTIONAL PROPERTIES OF THE CIRCULAR FRACTIONS, by Monroe Ames; $5.00.

Written by a structural designer and engineer, this handbook lists values for every five degrees of arc for the three figures that ean be designated circular fractions—the sector, segment, and fillet. Methods also are given by which the properties of the hollow sector can be found.

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Photo Left — Engine driven application City of Pensacola, Florida.

Photo Right—Combination Drive application, Clintonville, Wisconsin.

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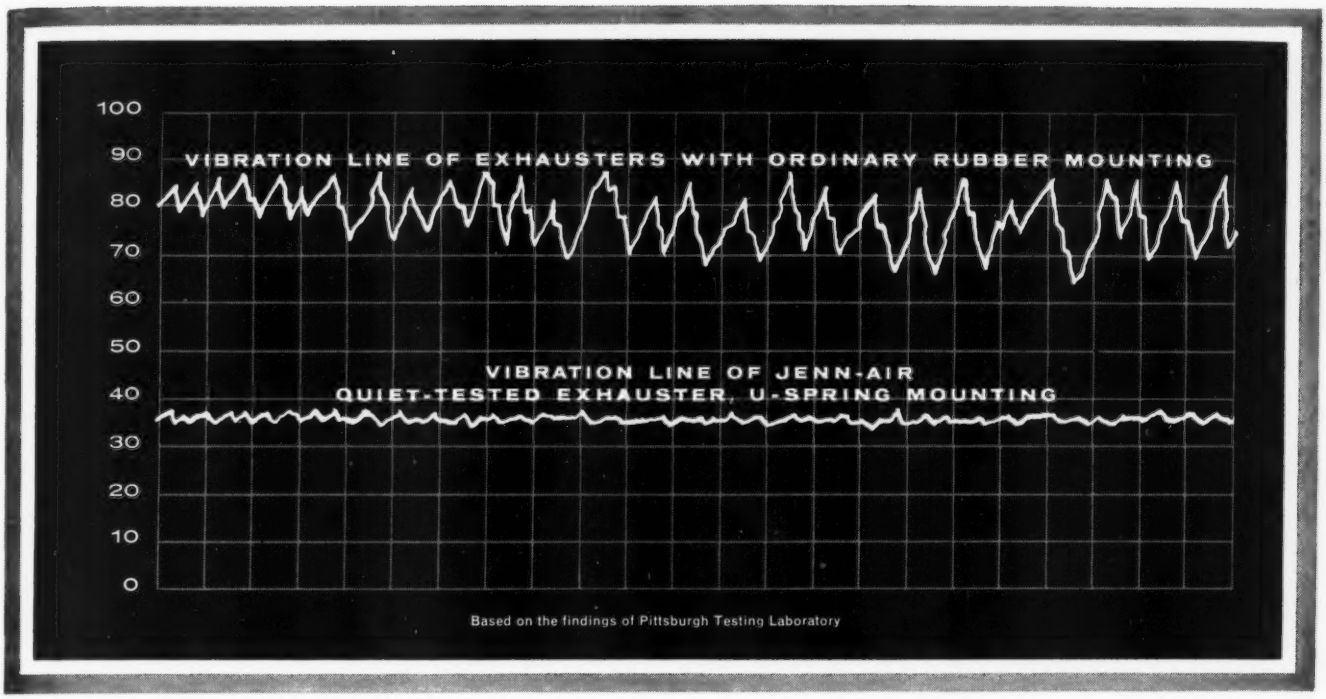

The above chart shows a comparison of vibration levels between ordinary exhausters and Jenn-Air Quiet-Tested Exhausters.

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Noise elimination is a problem which faces the ventilation industry today. To minimize the noise caused by vibration, Jenn-Air developed the Quiet-Tested Roof Exhauster with U-Spring cushion suspension. Now an independent laboratory offers proof positive this new principle of suspending the power assembly with U-Springs does the job. The PITTSBURGH TESTING LABORATORY, an independent research firm, was recently asked to compare Jenn-Air's Quiet-Tested Roof Exhauster, with U-Spring Suspension Mounting, against exhausters with ordinary rubber isolators. Tests were conducted under actual working conditions. Result: (see chart for dramatic evidence): *Jenn-Air Exhausters showed 44% less vibration transmission than the other exhausters.*

U-SPRING CUSHION SUSPENSION MOUNTING REDUCES VIBRATION . . . NOISE LEVEL

This innovation is another important improvement by Jenn-Air. It ensures against the major operating vibration and noise being transmitted through the duct work and into the building. The stainless steel also assures you the permanency of this quiet operation. Jenn-Air—and only Jenn-Air—Quiet-Tested Exhausters are proved under simulated field conditions. Each unit must pass rigid inspection by the critical *Vibronic Eye* . . . is 'screened' in Jenn-Air's Sound-Elec Test Chamber to detect noise and vibration.

Patents Pending

Jenn-Air Quiet-Tested Roof Exhauster, with U-Spring Cushion Suspension Mounting. Note low contour design which complements modern architectural lines.

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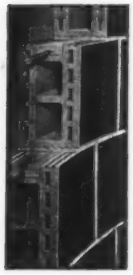

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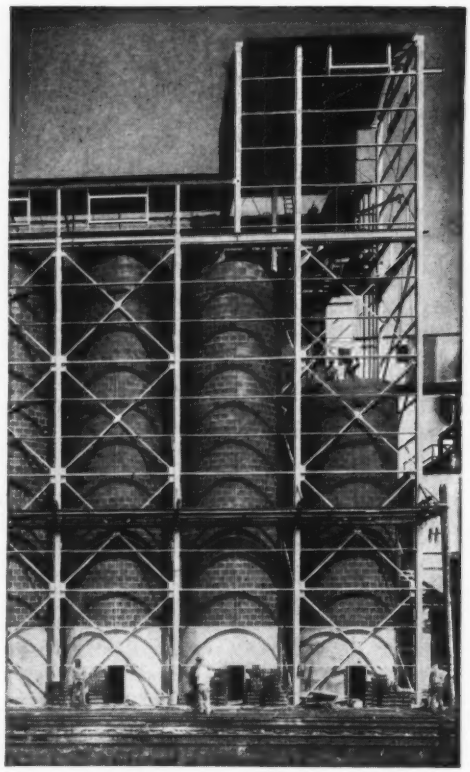

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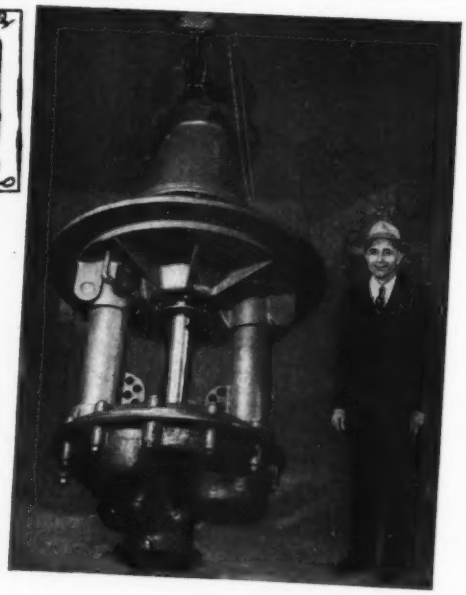

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Corp., this film shows how the process produces root pass welds with smooth uniform contours on the inside of the pipe, minimizing turbulence. A high speed camera was used to show actual melting and fusion of the insert to form a smooth bead.

●

"MOLDED MASTERS OF THE BTU," The Magnesia Insulation Manufacturers Association, color and sound slidefilm.

Describing a family of four thermal insulations produced by members for piping and equipment ranging from 200 to 1900 F, the film covers insulating theory, ingredients, production, application, and properties of the materials.

●

"THE CHANGING SOUTH," Southern Lightweight Aggregate Corp., 16 mm, sound and color, 18 min.

This film points out the changes in southern industry, commerce, transportation, and living conditions during recent years, stressing the importance of modern construction techniques and materials.

●

"RESEARCH—KEY TO PROGRESS," Armour Research Foundation of Illinois Institute of Technology, 16 mm, sound and color, 15 min.

The role of scientific research in the national economy is documented in this film. It traces the rise and contributions of research, particularly by independent industrial research organizations.

●

"ENGINEERING—A CAREER FOR TOMORROW," Eta Kappa Nu, 16 mm, available in color or black and white, sound, 25 min.

This film has been produced as an aid in promoting the field of engineering as a career. It explains an engineer's functions and opportunities available in engineering.

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